ALGEBRA 1-B

If a is slope and positive, then line rises as it moves to the right. b is y-intercept

1. Which of the following is a factored form of $4x^3y + 4xy^3$?

Factor out common factors from each term

F. $4x^3y^3(y+x)$
→ G. $4xy(x^2+y^2)$
H. $8xy(x^2+y^2)$
J. $4x^3y^3$
K. $8x^4y^4$

2. What is the slope of the line $5y = -3x + 10$?

slope intercept form $y = mx + b$

$m \rightarrow$ slope $b \rightarrow$ y-int.

F. -3
→ G. $-\frac{3}{5}$
H. $\frac{5}{3}$
J. 2
K. 10

$\frac{5y}{5} = \frac{-3x+10}{5}$

$y = \frac{-3}{5}x + 10$

3. If $17 - 3(x-2) = 33 - 8x$, then $2x$ = ?

$17 - 3x + 6 = 33 - 8x$

$5x = 10$

$x = 2$

$2 \cdot 2 = 4$

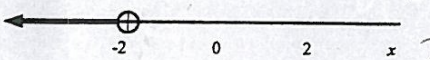
A. -4
B. 2
→ C. 4
D. 7.2
E. 8.8

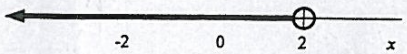
4. Which of the following is the graph of the solution set of $-2x > 4$?

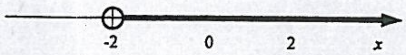
$\frac{-2x}{-2} > \frac{4}{-2}$

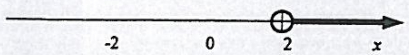
$x < -2$

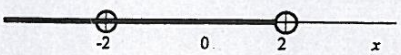
open O because $x < -2$

→ F. 

G. 

H. 

J. 

K. 

ALL x's are less than -2

5. The operation $x \sim y$ stands for $\frac{x+y}{x-y}$. Which of the following is equal to $7 \sim 3$?

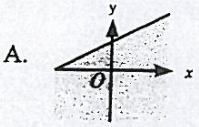
Plug and chug

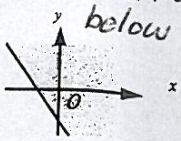
$\frac{7+3}{7-3} = \frac{10}{4} = 2\frac{1}{2}$

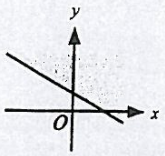
→ A. $2\frac{1}{2}$
B. 4
C. $5\frac{1}{4}$
D. 6
E. 10

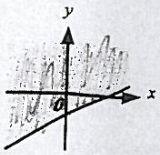
6. Which of the following best represents the graph of $y \le ax + b$ for some positive a and negative zb ?

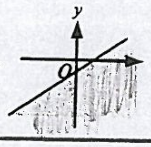
If $ab < 0$, then crosses below x-line

A. 

D. 

B. 

E. 

→ C. 

ALL y's are less than line.

7. A particle travels 1×10^8 centimeters per second in a straight line for 4×10^{-6} seconds. How many centimeters has it traveled?

$D = RT$

$D = 10^8 * 4 * 10^{-6}$

$= 4 * 10^2$

A. 2.5×10^2
B. 2.5×10^{13}
→ C. 4×10^2
D. 4×10^{-14}
E. 4×10^{-48}

8. For all nonzero r, t, and z values, $\frac{16r^3tz^5}{-4rt^3z^2}$ = ?

$\frac{16}{-4} * \frac{r^3}{r} * \frac{t}{t^3} * \frac{z^5}{z^2}$

$-4r^2t^{-2}z^3$

$\frac{-4r^2z^3}{t^2}$

F. $-\frac{4z^3}{r^2t^2}$
→ G. $-\frac{4r^2z^3}{t^2}$
H. $-\frac{4rz}{t}$
J. $-4r^4t^4z^7$
K. $-4r^2t^2z^3$

9. For all nonzero x and y, $\frac{1}{x} + \frac{1}{y}$ = ?

$\frac{y+x}{xy} = \frac{x+y}{xy}$

A. 2
B. $\frac{1}{xy}$
C. $\frac{2}{xy}$
→ D. $\frac{x+y}{xy}$
E. $\frac{2}{x+y}$

10. If $a \neq 0$, b is a real number, $a^3 = b$, and $a^4 = 2b$, then a = ?

$a^3 \cdot a = 2b$

$b \cdot a = 2b$

$a = 2$

→ F. 2
G. 3
H. 4
J. b
K. Cannot be determined from given information

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ALGEBRA I—C

1. It costs 90 cents to purchase x apples and 68 cents to purchase y oranges. Which of the following is an expression for the cost, in cents, of 5 apples and 7 oranges?

   F. $\frac{90}{5+x}+\frac{68}{7+y}$
   G. $7\left(\frac{90}{x}\right)+5\left(\frac{68}{y}\right)$
   H. $5\left(\frac{x}{90}\right)+7\left(\frac{y}{68}\right)$
   J. $5\left(\frac{90}{x}\right)+7\left(\frac{68}{y}\right)$
   K. $5\left(\frac{68}{x}\right)+7\left(\frac{90}{x}\right)$

   multiply to find total cost

2. For all x, $(2x-3)(x+5)=?$

   A. $x^2+2x-15$
   B. $2x^2-13x-15$
   C. $2x^2+2x-15$
   D. $2x^2+2x+15$
   E. $2x^2+7x-15$

   FOIL
   $2x^2+10x-3x-15$
   $2x^2+7x-15$

3. For all nonzero a and b, $\frac{(10a^2b^2)(-9a^2b^3)}{6a^2b^4}=?$

   A. $-15b$
   B. $-15a^2b$
   C. $-15a^2b^2$
   D. $\frac{a^2b^2}{15}$
   E. $\frac{12}{b}$

   5, -3
   1, 1
   FACTOR

4. If $2x+1=-3$, what is the value of x^2-3x?

   F. -10
   G. -1
   H. 2
   J. 5
   K. 10

   $2x=-4$
   $x=-2$
   $(-2)^2-3(-2)$
   $4+6=10$

5. In the standard (x,y) coordinate plane, what is the length of the line segment whose endpoints have coordinates $(-2,-3)$ and $(3,4)$?

   A. 12
   B. $\sqrt{74}$
   C. $2\sqrt{6}$
   D. $\sqrt{2}$
   E. $\sqrt{145}$

   Distance Formula
   $\sqrt{(3-(-2))^2+(4-(-3))^2}$
   $\sqrt{25+49}=\sqrt{74}$

6. In the standard (x,y) coordinate plane, if the x-coordinate of each point on a line is 4 less than twice its y-coordinate, the slope of the line is:

   F. -4
   G. -2
   H. ½
   J. 2
   K. 4

   $x=2y-4$
   $\frac{4+x=2y}{2}\quad\frac{}{2}$
   $2+\frac{1}{2}x=y$

7. If $ax+3=-7$, and x is a positive integer, then the value of a is restricted to the set of:

   A. integers.
   B. negative rational numbers.
   C. positive rational numbers.
   D. negative irrational numbers.
   E. positive irrational numbers.

   solve for a
   $ax=-10$
   $a=\frac{-10}{x}$
   If $x>0$, then a must be -

8. For all $x>0$, $\frac{2x^2+14x+24}{x+4}$ simplifies to:

   A. $x+3$
   B. $x+4$
   C. $2(x+3)$
   D. $2(x+4)$
   E. $2(x+3)(x+4)$

   since $x+4$ is in denominator $x+4$ is probably a factor
   $(2x+6)(x+4)$
   $(x+4)$

9. In the standard (x,y) coordinate plane, what are the coordinates of the midpoint of a line segment with endpoints $(-1,3)$ and $(2,7)$?

   F. $\left(\frac{1}{2},5\right)$
   G. $\left(1,\frac{9}{2}\right)$
   H. $\left(\frac{3}{2},2\right)$
   J. $(1,4)$
   K. $(3,4)$

   Mid Point formula
   $\left(\frac{-1+2}{2},\frac{3+7}{2}\right)$
   $\left(\frac{1}{2},5\right)$

10. If $x+y=21$, and $xy=108$, then $|x-y|=?$

    F. 3
    G. 5
    H. 7
    J. 9
    K. 11

    $|12-9|=3$
    $x=21-y$
    $(21-y)y=108$
    $21y-y^2=108$
    $y^2-21y+108=0$
    $(y-9)(y-12)=0$
    $y=9$
    $y=12$

1. There are n students in a class. If, among those students, $p\%$ play at least 1 musical instrument, which of the following general expressions represents the number of students who play NO musical instrument?

F. np
G. $.01np$
H. $\frac{(100-p)n}{100}$
J. $\frac{(1-p)n}{.01}$
K. $100(1-p)n$

n (100 − P) would be for the number who don't play

2. If n represents an even integer, which of the following also represent(s) an even integer?

I. $3n + 2$
II. $3(n + 1)$
III. $(n + 1)^2$

F. I only
G. II only
H. III only
J. I and II only
K. I and III only

multiplying even times an even or odd #, you will always get EVEN. the other Two may be odd.

3. If $a > 0$ and $b < 0$, then the sum of a and b:

A. is always positive.
B. is always negative.
C. is always zero.
D. cannot be zero, but can be any other real number.
E. can be any real number.

All depends on how big a and b are Try different Numbers.

4. A car rental company charges \$50.00 per day plus \$0.80 per mile for a full-size car, and charges \$30.00 per day plus \$0.50 per mile for a compact car. Which expression below gives the amount, in dollars, that the charge for a full-size car exceeds the charge for a compact car, when each is rented for x days and y miles?

F. $-20x - 0.30y$
G. $20x + 0.30y$
H. $20x + 30y$
J. $20x + 1.30y$
K. $80x + 1.30y$

Find the difference between Them
50 − 30 = 20
\$0.80 − \$0.50 = 0.30

5. What is the smallest number greater than 1 that, when divided by 2, 3, 4, 5, or 6, leaves a remainder of 1 in each case?

A. 7 → Fractions
B. 31 → 31 ÷ 2 = 15 3 remainder
C. 61
D. 121
E. 721

Work from smallest in your choices till You find what satisfies All. Use Calculator

6. A scuba diver often sends up a balloon-type marker. The marker starts out fairly small and gets larger as it approaches the surface. The chart below shows the marker's volume at multiples of 33 feet below the surface of the water. Which of the following equations fits these data?

d	depth in feet	0	33	66	99	132
V	volume in liters	1	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$

A. $V = \frac{33}{d+33}$
B. $V = \frac{d-33}{33}$
C. $V = -\frac{d}{66} + 1$
D. $V = \frac{132-d}{d}$
E. $V = \frac{d-33}{\frac{d}{33}+1}$

You can Test each one. Use 0 and see what happens

7. If $(m - n)^2 = 25$ and $mn = 36$, then $m^2 + n^2 =$?

A. −47
B. −11
C. 61
D. 86
E. 97

Looking at the two equation, I see that 9 and 4 would work
$9^2 + 4^2 = 81 + 16 = 97$

8. If you have gone 4.8 miles in 24 minutes, what was your average speed, in miles per hour?

A. 5.0
B. 10.0
C. 12.0
D. 19.2
E. 50.0

24 min. is 0.4 hour
$\frac{24}{60} = 0.4$ CONVERT
$4.8 \div 0.4 = 12$

9. Elkville High won a Friday night basketball game by 10 points; the next night they scored 25 points more than on Friday and again won by 10 points. The sum of the opponents' scores for the 2 games was 109. How many points did Elkville score on Friday?

A. 37
B. 41
C. 46
D. 52
E. 72

F = Elkville Friday Score
S = Elkville Saturday Score
$S = 25 + F$
$(F - 10) + (S - 10) = 109$

10. If $(x + m)^2 = x^2 + 12x + n$, where m and n are integers, what is the value of n?

F. 36
G. 30
H. 24
J. 18
K. 12

$(x+m)^2$ is a perfect Square so n has to be a perfect Square whose root adds up to 12. $\sqrt{36} = 6$
6 + 6 = 12

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ALGEBRA I — A

1. If $7y = 2x - 5$, then $x = ?$

Try to do in your head 1st

F. $5y + 5$
G. $\frac{7}{2}y - 5$
H. $\frac{7}{2}y + 5$
J. $\frac{7y - 5}{2}$
→ K. $\frac{7y + 5}{2}$

$7y = 2x - 5$

$\frac{7y + 5}{2} = \frac{2x}{2}$

2. Which of the following is a simplified version equivalent to $\frac{3 + 6x}{9x}$

A. $\frac{2x + 1}{3x}$
B. $\frac{1 + 6x}{3x}$
C. 1
D. 2
E. $\frac{7}{3}$

$\frac{3(1 + 2x)}{9x}$ or factor out 3 from each term

$\frac{1 + 2x}{3x} = \frac{2x + 1}{3x}$

3. $3 \times 10^{-4} = ?$

F. -30,000
G. -120
H. 0.00003
→ J. 0.0003
K. 0.12

$10^{-4} = \frac{1}{10,000}$

$3 \times \frac{1}{10,000} = \frac{3}{10,000} =$

0.0003 4 0's means 4 decimal places

4. What is the value of the expression $x^3 - 2x^2 + 4x + 4$ for $x = -2$?

F. 12
G. -2
H. -4
J. -8
→ K. -20

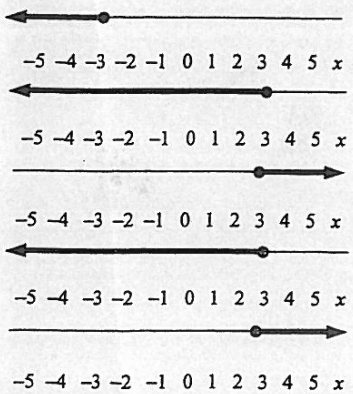
$(-2)^3 - 2(-2)^2 + 4(-2) + 4$

$-8 - 8 + (-8) + 4$

$-24 + 4 = -20$

5. When 4 times x is increased by 7, the result is less than 19. Which of the following is a graph of the real numbers x that satisfy this relationship?

A.
B.
C.
→ D.
E.



Solid dot is ≥ or ≤

open dot is > or <

$4x + 7 < 19$

$4x < 12$

$x < 3$

6. Which of the following is always equal to $a(5 - a) - 6(a + 4)$?

A. $-2a - 24$
B. $-2a + 4$
→ C. $-a^2 - a - 24$
D. $-a^2 - a + 4$
E. $-2a^3 - 24$

$5a - a^2 - 6a - 24$

$-a^2 - a - 24$

7. If $\frac{5}{u - 2} = \frac{15}{u + 4}$, then $u = ?$

$5(u + 4) = 15(u - 2)$

A. -3
B. -1
C. 3
D. 4
→ E. 5

divide out 5

$u + 4 = 3u - 6$

$10 = 2u$

$5 = u$

You can multiply 1st by $\frac{3}{3}$ then set denominators =

8. For all x, $x^7 + 7x + x^7 + 7x$ equals which of the following expressions?

F. $14x^{14}$
G. $14x^{16}$
H. $16x^{16}$
→ J. $2x^7 + 14x$
K. $x^{14} + 14x$

$x^7 + x^7 + 7x + 7x$

$2x^7 + 14x$

9. Which of the following expressions gives the slope of the line connecting the points (6,8) and (–4,–10) in the standard (x,y) coordinate plane?

A. $\frac{8 + (-10)}{-6 - (-4)}$
B. $\frac{8 + (-10)}{-4 + 6}$
C. $\frac{8 - (-10)}{6 - (-4)}$
D. $\frac{8 - (-10)}{-4 - 6}$
E. $\frac{8 - (-10)}{-6 + 4}$

$\text{Slope} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{8 - (-10)}{6 - (-4)} = \frac{18}{10}$

$\frac{-10 - 8}{-4 - 6} = \frac{-18}{-10} = \frac{18}{10}$

10. For all a and b, $3a^2b^3(2a^3b^3) = ?$

F. $5a^5b^6$
G. $5a^6b^9$
H. $6a^2b^3$
→ J. $6a^5b^6$
K. $6a^6b^9$

It's ALL multiplication, so order doesn't matter. Match up corresponding variables and constants

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ALGEBRA II-A

1. Which of the following is a value of t for which $(t-3)(t+2)=0$?

A. 2
B. 3
C. 5
D. 6
E. 7

If $xy=0$, then either x is 0 or y is 0
$t-3=0$ or $T+2=0$
$T=3$ or $T=-2$

2. Which of the following is an irrational number? (Note: an irrational number CANNOT be expressed as the quotient of 2 integers.)

F. .64 → $\frac{64}{100}$ rational
G. .91 → $\frac{91}{100}$ rational
H. $\frac{4}{9}$ → $\frac{4}{9}$ rational
J. $\sqrt{13}$ → Irrational
K. $\sqrt{144}$ → 12 → $\frac{12}{1}$ Rational

3. What is the next term after $-\frac{1}{4}$ in the geometric sequence 16, –4, 1, $-\frac{1}{4}$, ...?

A. $-\frac{1}{8}$
B. 0
C. $\frac{1}{16}$
D. $\frac{1}{8}$
E. $\frac{1}{2}$

Geometric → find common ratio
Arithmetic common difference
$\frac{16}{-4}=\frac{-1}{4}$
$-\frac{1}{4}*\frac{-1}{4}=\frac{1}{16}$

4. Which of the following equations has y varying directly as the square of w and inversely as the cube of t?

F. $\frac{y^2}{t^3}=w$
G. $\frac{w^2}{t^3}=y$
H. $\frac{t^2}{w^3}=y$
J. $\frac{\sqrt{w}}{\sqrt[3]{t}}=y$
K. $\frac{w^2}{y^3}=t$

Direct variation is like slope $y=kx$
Inverse has k in numerator and x in denominator $y=\frac{k}{x}$
or $k=yx$

5. For what value of a would the following system of equations have an infinite number of solutions?

$$2x-3y=8$$
$$6x-9y=4a$$

F. 2
G. 6
H. 8
J. 24
K. 32

Notice how if you multiply by 3, you'd have a multiple of $2x-3y=8$
$8\times3=24$
$24=4a$

6. The formula for finding the surface area of a right circular cylinder is $S=2\pi r(r+a)$, where S is the surface area, r is the radius of the circular base, and a is the altitude perpendicular to that base. Which of the following is a formula for finding the altitude in terms of the surface area and the radius of the base?

A. $a=\frac{S-2\pi r}{2\pi r}$
B. $a=2\pi r(r+S)$
C. $a=\frac{S}{2\pi^2}$
D. $a=S(2\pi r)-r$
E. $a=\frac{S}{2\pi r}-r$

Solve for a
$S=2\pi r^2+a2\pi r$
$\frac{S-2\pi r^2}{2\pi r}=\frac{a2\pi r}{2\pi r}$
$\frac{S}{2\pi r}-\frac{2\pi r^2}{2\pi r}=a$
Same

7. The equation $10w^2+17w-20=0$ has what types of numbers as its two solutions?

A. One positive rational number and one negative rational number
B. One positive irrational number and one negative irrational number
C. Two positive real numbers
D. One negative real number and zero
E. One positive real number and zero

Tells all
$\frac{-17\pm\sqrt{17^2-4(10)(-20)}}{2(10)}$

8. If $x+y=6$, then $x^2=$?

A. $y^2-12y-36$
B. y^2-36
C. $6-y^2$
D. $36-y^2$
E. $36-12y+y^2$

$x=6-y$
$x^2=(6-y)^2$
$=36-12y+y^2$

9. In the standard (x,y) coordinate plane, the graph of $(x-2)^2+(y+4)^2=9$ is a circle. What is the area enclosed by this circle, expressed in square coordinate units?

A. 3π
B. 4π
C. 6π
D. 9π
E. 16π

Formula for circle
$(x-h)^2+(y-k)^2=r^2$
(h,k) center r = radius
$r^2=9$ $r=3$
$\pi r^2=A$
$\pi(3)^2=9\pi$

10. A ball is thrown straight down from a tall cliff. The distance, s feet, that it travels in the first t seconds is given by $s=16t^2+25t$. How far, in feet, does the ball travel in the first 3 seconds?

F. 91
G. 123
H. 169
J. 171
K. 219

$16(3)^2+25(3)$
$144+75$
219

$\sqrt{-1}$ is Not real

ALGEBRA II-B

1. $\sqrt{x-5}$ is a real number if and only if:

   the expression becomes UNREAL when $x < 5$

   $x - 5 \geq 0$

   $x \geq 5$

   A. $x < -5$
   B. $-5 < x < 0$
   C. $x = 0$
   D. $0 < x < 5$
   E. $x > 5$

2. Six plants, each of a different plant type, are to be arranged on a display shelf's 6 spots. If each spot must have a plant, in how many different arrangements can the plants be placed?

   $6 \times 5 \times 4 \times 3 \times 2 \times 1 =$

   720

   F. 6
   G. 21
   H. 30
   J. 36
   K. 720

3. Which of the following is a factor of $x^2 - 5x - 6$?

   $(x-6)(x+1) = ?$

   F. $(x - 1)$
   G. $(x + 2)$
   H. $(x - 2)$
   J. $(x - 3)$
   K. $(x - 6)$

4. The real values of x for which $|2x - 3| < 4$ are exactly the values of x such that:

   Split

   $2x - 3 < 4$ | $2x - 3 > 4$

   $2x < 7$ | $2x > 1$

   $x < 3.5$ | $x > 0.5$

   F. $0 < x < 3.5$
   G. $.5 < x < 3.5$
   H. $-.5 < x < 0$
   J. $x < -.5$
   K. $x < 3.5$

5. A manufacturing company processes raw ore. The number of tons of refined material the company can produce during t days using Process A is $A(t) = t^2 + 2t$ and using Process B is $B(t) = 10t$. The company has only 7 days to process ore and must choose 1 of the processes. What is the maximum output of refined material, in tons, for this time period?

   Process A $\rightarrow 7^2 + 2(7)$

   $\rightarrow 49 + 14$

   $\rightarrow 63$

   Process B $10(7) = 70$

   A. 8
   B. 10
   C. 51
   D. 63
   E. 70

6. What are the values of a and b, if any, where $a|b - 2| < 0$?

   $b - 2$ can't be zero because any # times a would be equal to 0

   A. $a < 0$ and $b - 2 \neq 0$
   B. $a < 0$ and $b = 2$
   C. $a \neq 0$ and $b < 2$
   D. $a > 0$ and $b < 2$
   E. There are no such values of a and b

7. $\sqrt{50} + \sqrt{128} = ?$

   $\sqrt{25 \cdot 2} + \sqrt{64 \cdot 2}$

   $5\sqrt{2} + 8\sqrt{2}$

   $13\sqrt{2}$

   F. $13\sqrt{2}$
   G. $14\sqrt{2}$
   H. $2\sqrt{5} + 2\sqrt{8}$
   J. $89\sqrt{2}$
   K. $\sqrt{178}$

8. If $x > 0$ and $2x^2 - 5x - 12 = 0$, then $x = ?$

   $(2x + 3)(x - 4) = 0$

   $2x = -3$ $\quad x = 4$

   $x = \frac{-3}{2}$

   A. $\frac{3}{2}$
   B. 2
   C. 4
   D. 5
   E. 12

9. The price of admission for a concert was \$8 for adults and \$5 for children. Altogether, 1,024 tickets were sold, for a total of \$6,680. How many children's tickets were sold?

   $x + y = 1024$

   $5x + 8y = 6680$

   $x = 1024 - y$

   $5(1024 - y) + 8y = 6680$

   A. 140
   B. 308
   C. 504
   D. 716
   E. 724

10. If $x + y = -2$, and $x - y = -3$, then $x^2 - y^2 = ?$

    $x^2 - y^2 = (x + y)(x - y)$

    Substitute

    $= (-2)(-3)$

    $= 6$

    F. 13
    G. 6
    H. 5
    J. -5
    K. -6

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$x^2 = \sqrt{x^4}$

ALGEBRA II-C

1. For positive real numbers x, y, and z, which of the following expressions is equivalent to $x^{\frac{1}{2}}y^{\frac{2}{3}}z^{\frac{5}{6}}$?

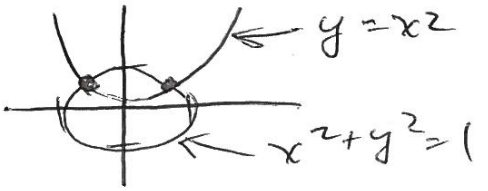
   A. $\sqrt[3]{xy^2z^3}$
   B. $\sqrt[6]{xy^2z^5}$
   C. $\sqrt[6]{x^3y^2z^3}$
   D. $\sqrt[6]{x^3y^4z^5}$
   E. $\sqrt[11]{xy^2z^5}$

Put denominator in common

$x^{\frac{3}{6}}y^{\frac{4}{6}}z^{\frac{5}{6}} = \sqrt[6]{x^3y^4z^5}$

2. In the standard coordinate plane, what is the number of points where the graphs of $y = x^2$ and $x^2 + y^2 = 1$ intersect?

   A. 0
   B. 1
   C. 2
   D. 3
   E. 4



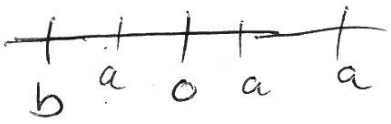
3. If 537^{102} were calculated, it would have 279 digits. What would the digit farthest to the right be (the ones digit)?

   A. 1
   B. 3
   C. 4
   D. 7
   E. 9

$7 * 7 = 49$

4. If a and b are real numbers, and $a > b$ and $b < 0$, then which of the following inequalities must be true?

   A. $a > 0$
   B. $a < 0$
   C. $a^2 > b^2$
   D. $a^2 < b^2$
   E. $b^2 > 0$



5. For all positive integers x and n, $(2x^{n+2})(3x^{3-n}) = 6x^p$. What is the value of p?

   A. -2
   B. 0
   C. 3
   D. 5
   E. 6

$6x^{N+2+3-N} = (2x^{n+2})(3x^{3-n}) = 6x^p$

$6x^5 = 6x^p$ then $p = 5$

6. If x and y are positive rational numbers that are less than 1, which of the following must be a positive rational number less than 1?

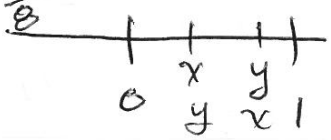
   I. $x + y$
   II. xy
   III. $\frac{x}{y}$

   F. I only
   G. II only
   H. III only
   J. I and III only
   K. II and III only

When you multiply fractions the product is smaller

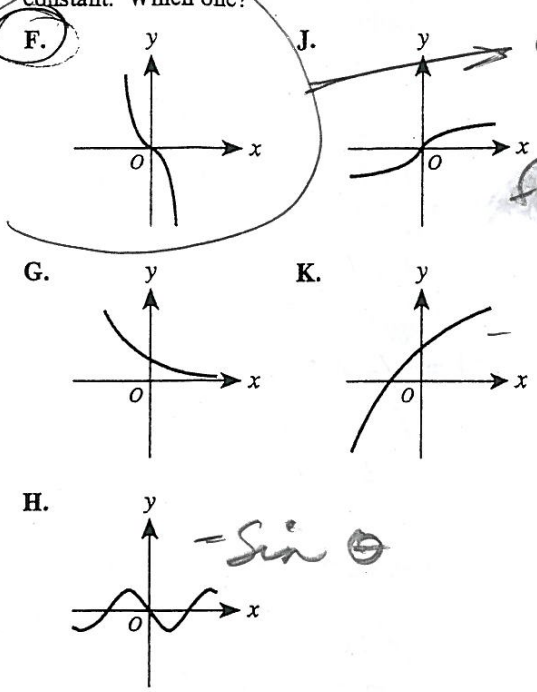
$\frac{3}{4} + \frac{7}{8} > 1$

$\frac{\frac{3}{4}}{\frac{7}{8}} = \frac{24}{21} > 1$



7. One of the graphs below is that of $y = Ax^3$, where A is a constant. Which one?

   F.
   J.
   G.
   K.
   H.



Cubic function

$f(x) = \sqrt[3]{x}$

8. If $(x + 3)$ is a factor of $2x^2 + 10x + k$, what is the value of k?

   A. 15
   B. 12
   C. 3
   D. –6
   E. –9

If $(x+3)$ is one factor, then the other one must begin with $(2x + ?)(x+3)$

? must be 4 to make $10x$

9. In the standard (x,y) coordinate plane, the graph of $3x^2 + 3y^2 + 6x + 12y = 33$ can be classified as:

   A. a circle.
   B. an ellipse, but not a circle.
   C. a hyperbola.
   D. a line.
   E. a parabola.

General equation for circle

$(x-h)^2 + (y-k)^2 = R^2$

10. What is the sum of the 2 real solutions to the equation $x = 6 - x^2$?

   A. 6
   B. 2
   C. 1
   D. –1
   E. –6

$x^2 + x - 6 = 0$

$(x+3)(x-2) = 0$

$x = -3 \quad x = 2$

$-3 + 2 = -1$

11. What is the smallest possible value for the product of two real numbers that differ by 6?

   F. -36
   G. -9
   H. -6
   J. 0
   K. 9

$x - y = 6$

$x = 3 \quad y = -3$

$3x - 3 = 9$

ALGEBRA II—D

1. Which of the following is an equation of the largest circle that can be inscribed in the ellipse with equation $\frac{(x-1)^2}{9} + \frac{(y+3)^2}{16} = 1$?

A. $(x-1)^2 + (y+3)^2 = 144$
B. $(x-1)^2 + (y+3)^2 = 16$
C. $(x-1)^2 + (y+3)^2 = 9$
D. $x^2 + y^2 = 16$
E. $x^2 + y^2 = 9$

If circle goes inside, it can only go up to the minor axis of ellipse → this one wouldn't be inscribed

2. If $x + 2y = 1$, and $2x + y = 5$, then $x + y$ = ?

A. 1
B. 2
C. 3
D. 4
E. 6

$x = 1 - 2y$
$2(1-2y) + y = 5$
$2 - 4y + y = 5$
$2 - 5 = 3y$ $x = 3$

3. If $2a^2b^3 < 0$, then which of the following CANNOT be true?

F. $a = b$
G. $a < 0$
H. $a > 0$
J. $b < 0$
K. $b > 0$

$2a^2$ will always be greater than 0 for $2a^2b^3$ b has to be less than 0

4. The first and second terms of a geometric sequence are n and an, in that order. What is the 1,000th term of the sequence?

A. $a^{999}n$
B. $a^{1,000n}$
C. $a^{1,001}n$
D. $(an)^{999}$
E. $(an)^{1,000}$

a is the geometric ratio
$ar^{(n-1)}$ = TERM U r LOOKING FOR
a = 1ST
r = common ratio
n = position #
$n \cdot a(1000-1)$

5. If $\log_x 81 = 4$, then x = ?

A. 3
B. 9
C. $\frac{81}{4}$
D. $\frac{81}{\log 4}$
E. 81^4

Log is the exponent
If $2^3 = 8$, then $\log_2 8 = 3$
$x^4 = 81$
$x = 3$

6. If $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$, which of the following *must* be true?

A. $a = b$
B. $a = 0$ and $b = 0$
C. $a = 0$ or $b = 0$
D. $a + b > 1$
E. $a = 1$ and $b > 0$

This doesn't even work with $a = 1$ and $b = 1$

7. Which of the following expresses $\left(\frac{x^{-1}y^2}{x^{26}y^{-214}}\right)^{\frac{2}{3}}$ with only positive integers as exponents?

F. $\frac{y^{144}}{x^{18}}$
G. $\frac{y^{36}}{x^9}$
H. $\frac{y^{36}}{x^{18}}$
J. $\frac{x^9}{y^{36}}$
K. $\frac{x^{18}}{y^{144}}$

Simplify the contents of parentheses 1st

$\left(\frac{y^{216}}{x^{27}}\right)^{\frac{2}{3}}$

$\frac{y^{216(\frac{2}{3})}}{x^{27(\frac{2}{3})}} = \frac{y^{144}}{x^{18}}$

8. For the complex number i such that $i^2 = -1$, what is the value of $i^4 + 2i^2$?

A. −2
B. −1
C. 0
D. 1
E. 2

$i^4 = (i^2)(i^2) = (-1)(-1) = 1$
$2i^2 = 2(-1) = -2$
$1 + -2 = -1$

9. The 2 distinct solutions to one of the quadratic equations below are $x = \frac{a}{b}$ and $x = -\frac{c}{d}$, where a, b, c, and d are positive integers. If only 1 of the equations below has those 2 solutions, which equation is it?

F. $(bx - a)(dx + c) = 0$
G. $(bx + a)(dx - c) = 0$
H. $(ax - b)(cx + d) = 0$
J. $(ax + b)(cx - d) = 0$
K. $\left(x - \frac{ac}{bd}\right)\left(x + \frac{ac}{bd}\right) = 0$

Solving for x

10. For all $x > 0$, which of the following is a simplified form of $\frac{3x^2 + 14x + 8}{x^2 + 6x + 8}$?

F. $\frac{3x+2}{x+2}$
G. $\frac{(3x+1)(x+8)}{(x+2)(x+4)}$
H. $3x + 2$
J. $2x^2 + 8x$
K. $6\frac{1}{3}$

$= \frac{(3x+2)(x+4)}{(x+2)(x+4)}$

11. If, for all x, $(ax + b)(cx + d) = qx^2 + rx = s$, then r = ?

F. ac
G. $a + c$
H. $b + d$
J. $ac(b + d)$
K. $ad + bc$

$acx^2 + adx + bcx + bd$
$adx + bcx = rx$
$ad + bc = r$

QUIZ

1. If $\frac{9b^3 - 15b^2 - 6b}{18b^2 + 6b} = 13b - 17$, then $b =$

   (A) $3\frac{1}{2}$

   (B) 3

   (C) $1\frac{7}{25}$

   (D) $\frac{5}{16}$

   (E) $-\frac{14}{5}$

2. If $a > b$, then which of the following statements must also be true?

   I. If $x < 0$, then $\frac{a}{x} < \frac{b}{x}$.

   II. If $c > d$, then $b - d < a + c$.

   III. If $x < 0$, then $\frac{x}{a} < \frac{x}{b}$.

   (F) I only
   (G) III only
   (H) II and III only
   (J) I and III only
   (K) I, II, and III

3. It takes Paul m minutes to mow the lawn. Assuming he mows at a constant rate, after Paul mows for k minutes, what part of the lawn remains to be mowed?

   (A) $\frac{m-k}{m}$

   (B) $\frac{m}{k}$

   (C) $1 - \frac{k}{m}$

   (D) $\frac{k-m}{k}$

   (E) $\frac{k}{m}$

4. How many ounces of soy sauce must be added to an 18-ounce mixture of peanut sauce and soy sauce consisting of 32% peanut sauce in order to create a mixture that is 12% peanut sauce?

   (F) 21

   (G) $24\frac{3}{4}$

   (H) $26\frac{2}{3}$

   (J) 30

   (K) $38\frac{2}{5}$

5. Barbara invests $2,400 in the National Bank at 5%. How much additional money must she invest at 8% so that the total annual income will be equal to 6% of her entire investment?

   (A) $1,200
   (B) $3,000
   (C) $1,000
   (D) $3,600
   (E) $2,400

6. Under which of the following conditions must $a^2 - b^2$ be greater than $(3a + 3b)(2a - 2b)$?

   (F) $b < a < -1$
   (G) $b < 0 < a$
   (H) $a < 0 < b$
   (J) $a < b < 0$
   (K) $a < b < -1$

7. Which of the following is one root of the equation $5x^2 + 8 = 4x$?

   (A) $\frac{5 - 6i}{4}$

   (B) $\frac{-2 + 6i}{5}$

   (C) $\frac{2 + 6i}{5}$

   (D) $\frac{1 + 3i}{10}$

   (E) $\frac{5 - 4i}{8}$

8. David averaged 70 on his first m exams. After taking n more exams, his overall average increased to 75. In terms of n and m, his average for his last n exams was

   (F) $\frac{5m + 75}{n}$

   (G) $\frac{5m}{n} + 75$

   (H) $\frac{5n}{m} + 75$

   (J) $m + 15n$

   (K) $\frac{70m + 75n}{m + n}$

9. How many pounds of nuts selling for 70 cents per pound must be mixed with 30 pounds of nuts selling at 90 cents per pound to make a mixture that sells for 85 cents per pound?

   (A) 24
   (B) 20
   (C) 15
   (D) 12
   (E) 10

10. A passenger train and a freight train leave at 10:30 a.m. from stations that are 405 miles apart. The trains travel toward each other at a constant speed, the passenger train traveling 45 mph faster than the freight train. If they pass each other at 1:30 p.m., how fast is the passenger train traveling, in miles per hour?

    (F) 75
    (G) 82.5
    (H) 90
    (J) 95
    (K) 105

QUIZ

1. If $\frac{9b^3 - 15b^2 - 6b}{18b^2 + 6b} = 13b - 17$, then $b =$

   (A) $3\frac{1}{2}$

   (B) 3

   (C) $1\frac{7}{25}$

   (D) $\frac{5}{16}$

   (E) $-\frac{14}{5}$

2. If $a > b$, then which of the following statements must also be true?

   I. If $x < 0$, then $\frac{a}{x} < \frac{b}{x}$.

   II. If $c > d$, then $b - d < a + c$.

   III. If $x < 0$, then $\frac{x}{a} < \frac{x}{b}$.

   (F) I only
   (G) III only
   (H) II and III only
   (J) I and III only
   (K) I, II, and III

3. It takes Paul m minutes to mow the lawn. Assuming he mows at a constant rate, after Paul mows for k minutes, what part of the lawn remains to be mowed?

   (A) $\frac{m-k}{m}$

   (B) $\frac{m}{k}$

   (C) $1 - \frac{k}{m}$

   (D) $\frac{k-m}{k}$

   (E) $\frac{k}{m}$

4. How many ounces of soy sauce must be added to an 18-ounce mixture of peanut sauce and soy sauce consisting of 32% peanut sauce in order to create a mixture that is 12% peanut sauce?

   (F) 21

   (G) $24\frac{3}{4}$

   (H) $26\frac{2}{3}$

   (J) 30

   (K) $38\frac{2}{5}$

5. Barbara invests $2,400 in the National Bank at 5%. How much additional money must she invest at 8% so that the total annual income will be equal to 6% of her entire investment?

   (A) $1,200
   (B) $3,000
   (C) $1,000
   (D) $3,600
   (E) $2,400

6. Under which of the following conditions must $a^2 - b^2$ be greater than $(3a + 3b)(2a - 2b)$?

   (F) $b < a < -1$
   (G) $b < 0 < a$
   (H) $a < 0 < b$
   (J) $a < b < 0$
   (K) $a < b < -1$

7. Which of the following is one root of the equation $5x^2 + 8 = 4x$?

   (A) $\frac{5 - 6i}{4}$

   (B) $\frac{-2 + 6i}{5}$

   (C) $\frac{2 + 6i}{5}$

   (D) $\frac{1 + 3i}{10}$

   (E) $\frac{5 - 4i}{8}$

8. David averaged 70 on his first m exams. After taking n more exams, his overall average increased to 75. In terms of n and m, his average for his last n exams was

   (F) $\frac{5m + 75}{n}$

   (G) $\frac{5m}{n} + 75$

   (H) $\frac{5n}{m} + 75$

   (J) $m + 15n$

   (K) $\frac{70m + 75n}{m + n}$

9. How many pounds of nuts selling for 70 cents per pound must be mixed with 30 pounds of nuts selling at 90 cents per pound to make a mixture that sells for 85 cents per pound?

   (A) 24
   (B) 20
   (C) 15
   (D) 12
   (E) 10

10. A passenger train and a freight train leave at 10:30 a.m. from stations that are 405 miles apart. The trains travel toward each other at a constant speed, the passenger train traveling 45 mph faster than the freight train. If they pass each other at 1:30 p.m., how fast is the passenger train traveling, in miles per hour?

    (F) 75
    (G) 82.5
    (H) 90
    (J) 95
    (K) 105

ANSWERS AND EXPLANATIONS

1. **The correct answer is (C).** On the left side of the equation, factor the numerator and denominator. (There's a factorable quadratic expression in the numerator.) Then divide common terms and solve for b:

$$\frac{3b(3b^2 - 5b - 2)}{6b(3b + 1)} = 13b - 17$$
$$\frac{(3b + 1)(b - 2)}{2(3b + 1)} = 13b - 17$$
$$\frac{b - 2}{2} = 13b - 17$$
$$b - 2 = 26b - 34$$
$$-25b = -32$$
$$b = \frac{32}{25}$$

2. **The correct answer is (J).** (I) is always true. Dividing each of two unequal numbers by the same negative number reverses the inequality. (II) could be either true or false, depending on the difference between a and b compared to the difference between c and d. (III) is always true. Multiplying each of two unequal numbers by the same negative number reverses the inequality.

Be sure to plug in easy, valid numbers for variables when you check your analysis.

3. **The correct answer is (A).** The longer Paul mows, the more lawn is mowed, so the variation is direct. Let x equal the portion of the lawn Paul has mowed after k minutes, set up the proportion, and solve for x:

$$\frac{m}{1} = \frac{k}{x}$$
$$mx = k$$
$$x = \frac{k}{m}$$

Paul has mowed $\frac{k}{m}$ of the lawn in k minutes. Still not mowed, then, is $1 - \frac{k}{m}$, or $\frac{m - k}{m}$.

4. **The correct answer is (J).** Letting x equal the number of ounces of soy sauce added to the mixture, $18 + x$ equals the total amount of the mixture after the soy sauce is added. The amount of peanut sauce (5.76 ounces) must equal 12% of the new total amount of the mixture, which is $18 + x$. You can express this as an algebraic equation and solve for x:

$$5.76 = .12(x + 18)$$
$$576 = 12(x + 18)$$
$$576 = 12x + 216$$
$$360 = 12x$$
$$30 = x$$

30 ounces of soy sauce must be added to achieve a mixture that includes 12% peanut sauce.

5. **The correct answer choice is (A).** If Barbara invests x additional dollars at 8%, her total investment will amount to $(2{,}400 + x)$ dollars.

$$.05(2400) + .08x = .06(2400 + x)$$
$$5(2400) + 8x = 6(2400 + x)$$
$$12000 + 8x = 14400 + 6x$$
$$2x = 2400$$
$$x = 1200$$

6. **The correct answer is (F).** $a^2 - b^2$ can be expressed in its factored form: $(a + b)(a - b)$. Notice the similarity between this expression and the other one. Factor out the constants (numbers) in $(3a + 3b)(2a - 2b)$ so that it more closely resembles $a^2 - b^2$:

$$(3a + 3b)(2a - 2b) = 6(a + b)(a - b)$$
$$= 6(a^2 - b^2)$$

Given $b < a < -1$, choice (F), $(a^2 - b^2)$ must be a negative number. Multiplying this negative number by 6 yields an even lesser number (to the left on the real number line). Therefore, if $b < a < -1$, then $a^2 - b^2 > (3a + 3b)(2a - 2b)$.

7. **The correct answer is (C).** First, express the equation in the standard form: $5x^2 - 4x + 8 = 0$ [$a = 5$, $b = -4$, $c = 8$]. Then, apply the quadratic formula:

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(5)(8)}}{2(5)}$$
$$= \frac{4 \pm \sqrt{16 - 160}}{10}$$
$$= \frac{4 \pm \sqrt{-144}}{10}$$
$$= \frac{4 \pm 12i}{10}$$
$$= \frac{2 \pm 6i}{5}$$

The two roots are $\frac{2 + 6i}{5}$, choice (C), and $\frac{2 - 6i}{5}$.

8. **The correct answer is (G).** Since David's overall average was 75, his exam scores for $(m + n)$ exams totaled $75(m + n)$, or $75m + 75n$. Since he averaged 70 on his first m exams, his aggregate score for those exams was $70m$. Hence, his total on the last n exams was $(75m + 75n) - (70m) = 5m + 75n$. Accordingly, his average for his last n exams was $\frac{5m + 75n}{n} = \frac{5m}{n} + \frac{75n}{n} = \frac{5m}{n} + 75$.

9. **The correct answer is (E).** The cost (in cents) of the nuts selling for 70 cents per pound can be expressed as $70x$, letting x equal the number that you're asked to determine. You then add this cost to the cost of the more expensive nuts ($30 \times 90 = 2{,}700$) to obtain the total cost of the mixture, which you can express as $85(x + 30)$. You can state this algebraically and solve for x as follows:

$$70x + 2700 = 85(x + 30)$$
$$70x + 2700 = 85x + 2550$$
$$150 = 15x$$
$$10 = x$$

10 pounds of 70-cent-per-pound nuts must be added in order to make a mixture that sells for 85 cents per pound.

10. **The correct answer is (H).** Notice that each train traveled for exactly 3 hours; in other words, time is constant. Let x equal the rate (speed) of the freight train. You can express the rate of the passenger train as $x + 45$. Substitute these values for time and rate into the speed formula for each train:

Formula:	rate × time = distance
Passenger:	$(x + 45)(3) = 3x + 135$
Freight:	$(x)(3) = 3x$

The total distance the two trains cover is given as 405 miles. Express this algebraically and solve for x:

$$(3x + 135) + 3x = 405$$
$$6x = 270$$
$$x = 45$$

Accordingly, the rate of the passenger train was $45 + 45$, or 90 mph.

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ALGEBRA II-A

Zero Product Property

1. Which of the following is a value of t for which $(t-3)(t+2)=0$?

All the choices ARE POSITIVE. the ONLY ONE is $t=3$

A. 2
B. 3
C. 5
D. 6
E. 7

2. Which of the following is an irrational number? (Note: an irrational number CANNOT be expressed as the quotient of 2 integers.)

Square roots of prime numbers are irrational

F. .64
G. .91
H. $\frac{4}{9}$
→ J. $\sqrt{13}$
K. $\sqrt{144}$

3. What is the next term after $-\frac{1}{4}$ in the geometric sequence 16, −4, 1, $-\frac{1}{4}$, ...?

Geometric sequence → Find common ratio

A. $-\frac{1}{8}$
B. 0
→ C. $\frac{1}{16}$
D. $\frac{1}{8}$
E. $\frac{1}{2}$

$\frac{-4}{16} = -\frac{1}{4}$ = common RATIO

$-\frac{1}{4} \times -\frac{1}{4} = \frac{1}{16}$

4. Which of the following equations has y varying directly as the square of w and inversely as the cube of t?

Direct Variation is like slope $y=kx$

F. $\frac{y^2}{t^3} = w$
→ G. $\frac{w^2}{t^3} = y$
H. $\frac{t^2}{w^3} = y$
J. $\frac{\sqrt{w}}{\sqrt[3]{t}} = y$
K. $\frac{w^2}{y^3} = t$

Inverse Variation has k in Numerator and x in denominator

$y = \frac{K}{x}$

5. For what value of a would the following system of equations have an infinite number of solutions?

$$2x - 3y = 8$$
$$6x - 9y = 4a$$

F. 2
→ G. 6
H. 8
J. 24
K. 32

$2 \times 3 = 6$ and $3 \times 3 = 9$

$8 \times 3 = 24 = 4a$ with $a = 6$

6. The formula for finding the surface area of a right circular cylinder is $S = 2\pi r(r+a)$, where S is the surface area, r is the radius of the circular base, and a is the altitude perpendicular to that base. Which of the following is a formula for finding the altitude in terms of the surface area and the radius of the base?

Solve for a (altitude)

A. $a = \frac{S-2\pi r}{2\pi r}$
B. $a = 2\pi r(r+S)$
C. $a = \frac{S}{2\pi^2}$
D. $a = S(2\pi r) - r$
→ E. $a = \frac{S}{2\pi r} - r$

$S = 2\pi r(r+a)$

$\frac{S-2\pi r^2}{2\pi r} = \frac{a 2\pi r}{2\pi r}$

$\frac{S}{2\pi r} - \frac{2\pi r^2}{2\pi r} = a$

$\frac{S}{2\pi r} - r = a$

7. The equation $10w^2 + 17w - 20 = 0$ has what types of numbers as its two solutions?

Tells ALL

→ A. One positive rational number and one negative rational number
B. One positive irrational number and one negative irrational number
C. Two positive real numbers
D. One negative real number and zero
E. One positive real number and zero

Solve for x

8. If $x + y = 6$, then $x^2 = ?$

$x = 6 - y$

$x^2 = (6-y)^2$

$= 36 - 12y + y^2$

A. $y^2 - 12y - 36$
B. $y^2 - 36$
C. $6 - y^2$
D. $36 - y^2$
→ E. $36 - 12y + y^2$

AREA of CIRCLE

9. In the standard (x,y) coordinate plane, the graph of $(x-2)^2 + (y+4)^2 = 9$ is a circle. What is the area enclosed by this circle, expressed in square coordinate units?

$(x-h)^2 + (y-k)^2 = r^2$

(h,k) Center r = radius

$r^2 = 9$ $r = 3$

$A = \pi r^2 \Rightarrow 9\pi$

A. 3π
B. 4π
C. 6π
→ D. 9π
E. 16π

10. A ball is thrown straight down from a tall cliff. The distance, s feet, that it travels in the first t seconds is given by $s = 16t^2 + 25t$. How far, in feet, does the ball travel in the first 3 seconds?

Plug in $t = 3$

$s = 16(3)^2 + 25(3)$

$s = 144 + 75$

$s = 219$

F. 91
G. 123
H. 169
J. 171
→ K. 219

ONE-TO-ONE LEARNING CENTER
the center of attention™

$X^{\frac{Y}{Z}} = \sqrt[Z]{X^Y}$

ALGEBRA II-C

1. For positive real numbers x, y, and z, which of the following expressions is equivalent to $\frac{1}{x^2}\frac{2}{y^3}\frac{5}{z^6}$?

   A. $\sqrt[3]{xy^2z^3}$
   B. $\sqrt[6]{xy^2z^5}$
   C. $\sqrt[6]{x^3y^2z^5}$
   → D. $\sqrt[6]{x^3y^4z^5}$
   E. $\sqrt[11]{xy^2z^5}$

   Put denominators with common mutiples
   $x^{\frac{3}{6}}\ y^{\frac{4}{6}}\ z^{\frac{5}{6}}$
   $\sqrt[6]{x^3y^4z^5}$

2. In the standard coordinate plane, what is the number of points where the graphs of $y = x^2$ and $x^2 + y^2 = 1$ intersect?

   A. 0
   B. 1
   → C. 2
   D. 3
   E. 4

   Sketch graphs and you'll easily see
   $y = x^2$
   $x^2 + y^2 = 1$

3. If 537^{102} were calculated, it would have 279 digits. What would the digit farthest to the right be (the ones digit)?

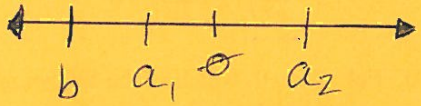
   A. 1
   B. 3
   C. 4
   D. 7
   → E. 9

   $7 * 7 = 49$

4. If a and b are real numbers, and $a > b$ and $b < 0$, then which of the following inequalities must be true?

   NO A. $a > 0$
   NO B. $a < 0$
   NO C. $a^2 > b^2$
   NO D. $a^2 < b^2$
   yes E. $b^2 > 0$

   Draw number line and label

5. For all positive integers x and n, $(2x^{n+2})(3x^{3-n}) = 6x^p$. What is the value of p?

   A. -2
   B. 0
   C. 3
   → D. 5
   E. 6

   $6x^{(n+2)+(3-n)}$
   $6x^5 = 6x^p \therefore p = 5$
   Rules of Exponents

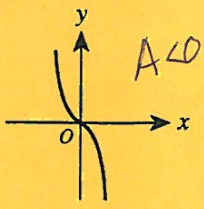
6. If x and y are positive rational numbers that are less than 1, which of the following must be a positive rational number less than 1?

   NO I. $x + y$ $\frac{7}{8} + \frac{5}{6} > 1$
   II. xy
   NO III. $\frac{x}{y}$ $\frac{7}{8}$

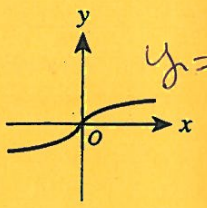
   F. I only
   → G. II only
   H. III only
   J. I and III only
   K. II and III only

   $\frac{\frac{7}{8}}{\frac{5}{6}} = \frac{42}{40} > 1$

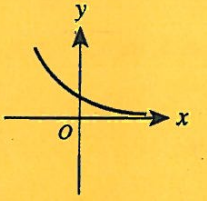
7. One of the graphs below is that of $y = Ax^3$, where A is a constant. Which one?

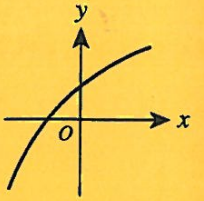
   F. 

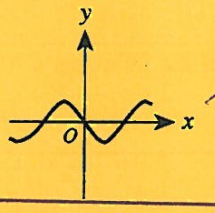
   A < 0

   J. 

   $y = \sqrt[3]{x}$

   G. 

   K. 

   H. 

   Trig graph
   $y = -\sin\theta$

8. If $(x + 3)$ is a factor of $2x^2 + 10x + k$, what is the value of k?

   A. 15
   → B. 12
   C. 3
   D. -6
   E. -9

   If $(x+3)$ is one of the factors, then the other must look like $(2x + ?)$.
   To make $10x$ from $(2x)_3$, ? must be 4
   $(2x+4)(x+3)$

9. In the standard (x,y) coordinate plane, the graph of $3x^2 + 3y^2 + 6x + 12y = 33$ can be classified as:

   → A. a circle.
   B. an ellipse, but not a circle.
   C. a hyperbola.
   D. a line.
   E. a parabola.

   General equation for circle

10. What is the sum of the 2 real solutions to the equation $x = 6 - x^2$?

    A. 6
    B. 2
    C. 1
    → D. -1
    E. -6

    Sum of Solutions $\frac{-B}{A}$
    Product of Solutions $\frac{C}{A}$
    $x^2 + x - 6 = 0$
    $-\frac{1}{1} = -1$

11. What is the smallest possible value for the product of two real numbers that differ by 6?

    F. -36
    → G. -9
    H. -6
    J. 0
    K. 9

    $x - y = 6$
    $x = 3 \quad y = -3$
    $3 * -3 = -9$

ALGEBRA II—D

If circle is inscribed it can only be as large as minor

1. Which of the following is an equation of the largest circle that can be inscribed in the ellipse with equation. $\frac{(x-1)^2}{9} + \frac{(y+3)^2}{16} = 1$?

Radius of circle must be 3, no bigger

minor axis major axis

A. $(x-1)^2 + (y+3)^2 = 144$ $R=12$
B. $(x-1)^2 + (y+3)^2 = 16$ $R=4$
→ C. $(x-1)^2 + (y+3)^2 = 9$
D. $x^2 + y^2 = 16$ $R=4$
E. $x^2 + y^2 = 9$ $R=3$ would be the right size, but not in ellipse

2. If $x + 2y = 1$, and $2x + y = 5$, then $x + y$ = ?

$2x+y=5$
$-(2x+4y=2)$
$-3y=3$
$y=-1$

$2x-1=5$
$2x=6$
$x=3$
$3+(-1)=2$

A. 1
→ B. 2
C. 3
D. 4
E. 6

3. If $2a^2b^3 < 0$, then which of the following CANNOT be true?

$2a^2$ will also be greater than 0. Therefore, b has to be negative

F. $a = b$
G. $a < 0$
H. $a > 0$
J. $b < 0$
→ K. $b > 0$

4. The first and second terms of a geometric sequence are n and an, in that order. What is the 1,000th term of the sequence?

Geometric Ratio
$\frac{An}{n} = A$

$na^{(1000-1)}$

$ar^{(n-1)}$ = The term you're looking for
a = 1st Term
r = common Ratio
n = Position in sequence

A. $a^{999}n$
B. $a^{1,000n}$
C. $a^{1,001}n$
D. $(an)^{999}$
E. $(an)^{1,000}$

5. If $\log_x 81 = 4$, then x = ?

Log is the exponent
$\log_x 81 = 4$ is the same as $x^4 = 81$
$3^4 = 81$

→ A. 3
B. 9
C. $\frac{81}{4}$
D. $\frac{81}{\log 4}$
E. 81^4

6. If $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$, which of the following *must* be true?

Does not work with anything except c

A. $a = b$
B. $a = 0$ and $b = 0$
→ C. $a = 0$ or $b = 0$
D. $a + b > 1$
E. $a = 1$ and $b > 0$

7. Which of the following expresses $\left(\frac{x^{-1}y^2}{x^{26}y^{-214}}\right)^{\frac{2}{3}}$ with only positive integers as exponents?

Simplify the contents of parentheses first

$\left(\frac{y^{216}}{x^{27}}\right)^{\frac{2}{3}}$

$\frac{\left(y^{216}\right)^{\frac{2}{3}}}{(x^{27})^{\frac{2}{3}}} = \frac{y^{144}}{x^{18}}$

→ F. $\frac{y^{144}}{x^{18}}$
G. $\frac{y^{36}}{x^9}$
H. $\frac{y^{36}}{x^{18}}$
J. $\frac{x^9}{y^{36}}$
K. $\frac{x^{18}}{y^{144}}$

8. For the complex number i such that $i^2 = -1$, what is the value of $i^4 + 2i^2$?

$i^4 = (i^2)(i^2) = (-1)(-1) = 1$
$2i^2 = 2(-1) = -2$
$1 + (-2) = -1$

A. -2
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9. The 2 distinct solutions to one of the quadratic equations below are $x = \frac{a}{b}$ and $x = -\frac{c}{d}$, where a, b, c, and d are positive integers. If only 1 of the equations below has those 2 solutions, which equation is it?

Solving for x, you get answer F.

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H. $(ax - b)(cx + d) = 0$
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K. $\left(x - \frac{ac}{bd}\right)\left(x + \frac{ac}{bd}\right) = 0$

10. For all $x > 0$, which of the following is a simplified form of $\frac{3x^2 + 14x + 8}{x^2 + 6x + 8}$?

$\frac{(3x+2)(x+4)}{(x+2)(x+4)}$

Do the denominator 1st to find factor for numerator

→ F. $\frac{3x+2}{x+2}$
G. $\frac{(3x+1)(x+8)}{(x+2)(x+4)}$
H. $3x + 2$
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11. If, for all x, $(ax + b)(cx + d) = qx^2 + rx = s$, then r = ?

is this? $-s$?

$ax^2c + axd + bcx + bd$
$= rx$

$rx = x(ad + bc)$

F. ac
G. $a + c$
H. $b + d$
J. $ac(b + d)$
→ K. $ad + bc$

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