3. Let f be a differentiable function such that $f(4) = 1$ and $f'(4) = 5$. If the tangent line to the graph of f at $x = 4$ is used to find an approximation to a zero of f, that approximation is

(A) 3.2

(B) 3.4

(C) 3.6

(D) 3.8

(E) None of these.

Ans

14. A differentiable function f has the property that $f(3) = 5$ and $f'(3) = 4$. What is an estimate for $f(2.8)$ using the linear appoximation for f at $x = 3$?

(A) 6.6
(B) 5.8
(C) 5.0
(D) 4.2
(E) 3.4

14. The line $x - 2y + 9 = 0$ is tangent to the graph of $y = f(x)$ at $(3, 6)$ and is also parallel to the line through $\big(1, f(1)\big)$ and $\big(5, f(5)\big)$. If f is differentiable on the closed interval $[1, 5]$ and $f(1) = 2$, find $f(5)$.

(A) 2

(B) 3

(C) 4

(D) 5

(E) none of these

2. For $x \neq 0$, the slope of the tangent to $y = x \cos x$ equals zero whenever

(A) $\tan x = -x$

(B) $\tan x = \frac{1}{x}$

(C) $\tan x = x$

(D) $\sin x = x$

(E) $\cos x = x$

15. The slope of the tangent line to the curve $2xy + \sin y = 2\pi$ at the point where $y = \pi$ is

(A) -2π

(B) $-\pi$

(C) 0

(D) π

(E) 2π

Ans

24. The slope of the line tangent to the graph of $\ln(x + y) = x^2$ at the point where $x = 1$ is

(A) 0 (B) 1 (C) $e - 1$ (D) $2e - 1$ (E) $e - 2$

Ans

22 The slope of line tangent to the graph of $f(x) = \ln(e^{2x} + 3\sin x)$ at $x = 0$ is

(A) 1

(B) 2

(C) 3

(D) 4

(E) 5

5. An equation of the line tangent to the graph of $f(x) = x(1 - 2x)^3$ at the point $(1, -1)$ is

(A) $y = -7x + 6$ (B) $y = -6x + 5$ (C) $y = -2x + 1$

(D) $y = 2x - 3$ (E) $y = 7x - 8$

20. An equation for a tangent line to the graph of $y = \text{Arctan}\,\frac{x}{3}$ at the origin is:

(A) $x - 3y = 0$

(B) $x - y = 0$

(C) $x = 0$

(D) $y = 0$

(E) $3x - y = 0$

1. At what input x do the graphs of $y = x^2 - \frac{1}{e^x}$ and $y = 2\sqrt{x}$ have parallel tangent lines?

(A) 0. 435 (B) 0.790 (C) 0.865 (D) 1.112 (E) 1.765

Ans

7. If $p(x) = (x - 1)(x + k)$ and if the line tangent to the graph of p at the point $(4, p(4))$ is parallel to the line $5x - y + 6 = 0$, then $k =$

(A) 2

(B) 1

(C) 0

(D) –1

(E) –2

Ans

5. Find the point on the graph of $y = \sqrt{x}$ between (1, 1) and (9, 3) at which the tangent to the graph has the same slope as the line through (1, 1) and (9, 3).

(A) (1, 1)

(B) $(2, \sqrt{2})$

(C) $(3, \sqrt{3})$

(D) (4, 2)

(E) none of the above

1. At what input x do the graphs of $y = x^2 - \frac{1}{e^x}$ and $y = 2\sqrt{x}$ have parallel tangent lines?

(A) 0. 435 (B) 0.790 (C) 0.865 (D) 1.112 (E) 1.765

2. For $x \neq 0$, the slope of the tangent to $y = x \cos x$ equals zero whenever

(A) $\tan x = -x$

(B) $\tan x = \frac{1}{x}$

(C) $\tan x = x$

(D) $\sin x = x$

(E) $\cos x = x$

Ans

7. An equation of the line tangent to the graph of $y = x^3 + 3x^2 + 2$ at its point of inflection is

(A) $y = -3x + 1$

(B) $y = -3x - 7$

(C) $y = x + 5$

(D) $y = 3x + 1$

(E) $y = 3x + 7$

Ans

20. An equation for a tangent line to the graph of $y = \text{Arctan}\,\frac{x}{3}$ at the origin is:

(A) $x - 3y = 0$

(B) $x - y = 0$

(C) $x = 0$

(D) $y = 0$

(E) $3x - y = 0$

25. The approximate value of $y = \sqrt{3 + e^x}$ at $x = 0.08$, obtained from the tangent to the graph at $x = 0$, is

(A) 2.01

(B) 2.02

(C) 2.03

(D) 2.04

(E) 2.05

1. Let $f(x) = 4x^3 - 3x - 1$. An equation of the line tangent to $y = f(x)$ at $x = 2$ is

(A) $y = 25x - 5$

(B) $y = 45x + 65$

(C) $y = 45x - 65$

(D) $y = 65 - 45x$

(E) $y = 65x - 45$

21. An equation of the normal to the graph of $f(x) = \dfrac{x}{2x-3}$ at $(1, f(1))$ is

(A) $3x + y = 4$

(B) $3x + y = 2$

(C) $x - 3y = -2$

(D) $x - 3y = 4$

(E) $x + 3y = 2$

1. The derivative of the function g is $g'(x) = \cos(\sin x)$. At the point where $x = 0$ the graph of g

I. is increasing, II. is concave down, III. attains a relative maximum point.

(A) I only (B) II only (C) III only (D) I and III only (E) I, II, III

13. If the line $3x - y + 2 = 0$ is tangent in the first quadrant to the curve $y = x^3 + k$, then $k =$

(A) 5

(B) –5

(C) 4

(D) 1

(E) –1

22. Let f be a differentiable function with $f(3) = 4$ and $f'(3) = 8$, and let g be the function defined by $g(x) = x\sqrt{f(x)}$. Which of the following is an equation of the line tangent to the graph of g at the point where $x = 3$?

(A) $y - 4 = 8(x - 3)$

(B) $y - 3 = 8(x - 6)$

(C) $y - 6 = 8(x - 3)$

(D) $y - 6 = 12(x - 3)$

(E) $y - 6 = -14(x - 3)$

5. Consider the curve $x + xy + 2y^2 = 6$. The slope of the line tangent to the curve at the point $(2,1)$ is

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

(B) $\frac{1}{3}$

(C) $-\frac{1}{3}$

(D) $-\frac{1}{5}$

(E) $-\frac{3}{4}$

Ans

7. If $p(x) = (x - 1)(x + k)$ and if the line tangent to the graph of p at the point $(4, p(4))$ is parallel to the line $5x - y + 6 = 0$, then $k =$

(A) 2

(B) 1

(C) 0

(D) –1

(E) –2

13. At how many points on the interval $-2\pi \le x \le 2\pi$ does the tangent to the graph of the curve $y = x\cos x$ have slope $\frac{\pi}{2}$?

(A) 5

(B) 4

(C) 3

(D) 2

(E) 1

3. The slope of the line tangent to the graph of $y = \ln \sqrt{x}$ at $(e^2, 1)$ is

(A) $\frac{e^2}{2}$ (B) $\frac{2}{e^2}$ (C) $\frac{1}{2e^2}$ (D) $\frac{1}{2e}$ (E) $\frac{1}{e}$

Ans

10. Let f be the function defined by $f(x) = 3 + \int_2^x \frac{20}{1+t^2}\,dt$. Which of the following is an equation of the line tangent to the graph of f at the point where $x = 2$?

(A) $y = 4(x-2)$

(B) $y-3 = 7(x-2)$

(C) $y-2 = 4(x-3)$

(D) $y-3 = 4(x-2)$

(E) $y-2 = 7(x-3)$

Ans

25. If y is a differentiable function of x, then the slope of the tangent to the curve $xy - 2y + 4y^2 = 6$ at the point where $y = 1$ is

(A) $\frac{1}{12}$ (B) $-\frac{1}{10}$ (C) $-\frac{1}{6}$ (D) $\frac{1}{4}$ (E) $-\frac{5}{6}$

Ans

18. The y-intercept of the tangent line to the curve $y = \sqrt{x+3}$ at the point $(1, 2)$ is

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) $\frac{5}{4}$ (E) $\frac{7}{4}$

Ans

2. The function f defined by $f(x) = e^{3x} + 6x^2 + 1$ has a horizontal tangent at $x =$

(A) -0.144 (B) -0.150 (C) -0.156 (D) -0.162 (E) -0.168

Ans

10. If functions f and g are defined so that $f'(x) = g'(x)$ for all real numbers x with $f(1) = 2$ and $g(1) = 3$, then the graph of f and the graph of g

(A) intersect exactly once;

(B) intersect no more than once;

(C) do not intersect;

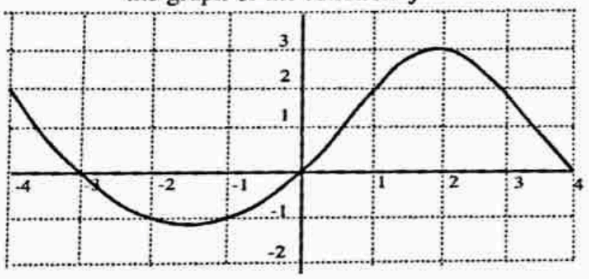
(D) could intersect more than once;

(E) have a common tangent at each point of tangency.

Ans

11. The graph of a function f whose domain is the interval $[-4, 4]$ is shown in the figure. If the graph of f has horizontal tangents at $x = -1.5$ and 2, which of the following statements are true?

the graph of the function f



I. The average rate of change of f over the interval from $x = -2$ to $x = 3$ is $\frac{1}{5}$.

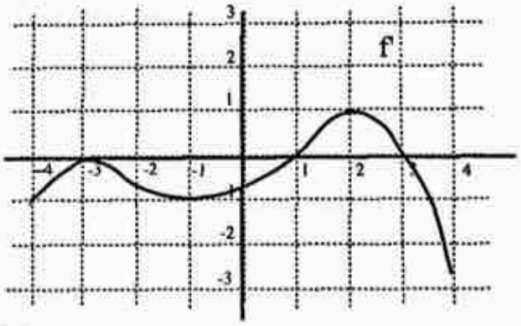
II. The slope of the tangent line at the point where $x = 2$ is 0.

III. The left-sum approximation of $\int_{-1}^{3} f(t)\,dt$ with 4 equal subdivisions is 4.

A) I only (B) I and II only (C) II and III only (D) I and III only (E) I, II, III

13. The figure shows the graph of f', the *derivative* of a function f. The domain of f is the interval $-4 \le x \le 4$. Which of the following are true about the graph of f?

graph of the derivative of f



I. At the points where $x = -3$ and $x = 2$ there are horizontal tangents.

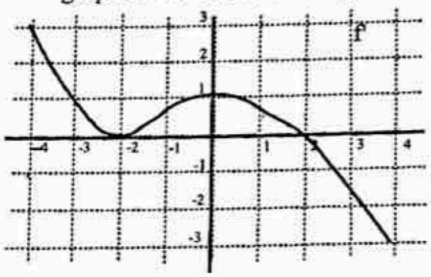
II. At the point where $x = 1$ there is a relative minimum point.

III. At the point where $x = -3$ there is an inflection point.

(A) None (B) II only (C) III only (D) II and III only (E) I, II, III

9. The graph of the *derivative* of f is shown at the right. If the graph of f' has horizontal tangents at $x = -2$ and 0, which of the following is true about the function f?

graph of the derivative of f



I. f is decreasing at $x = 0$.

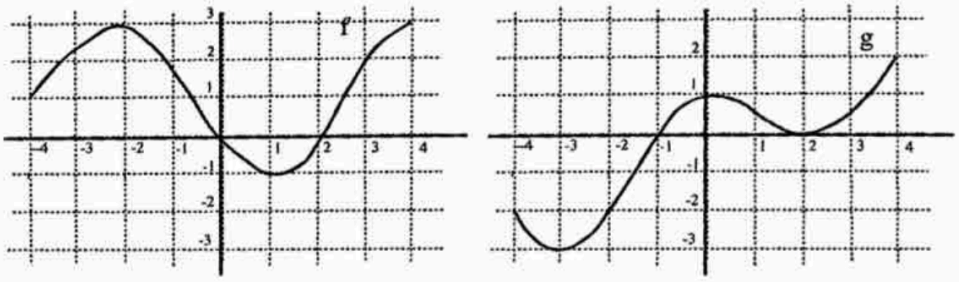
II. f has a local maximum at $x = 2$.

III. The graph of f is concave up at $x = -1$.

(A) I only (B) II only (C) I and II only (D) II and III only (E) I, II, III

Ans

17. The composite function h is defined by $h(x) = f[g(x)]$, where f and g are functions whose graphs are shown below. The graph of f has horizontal tangents at $x = -2$ and $x = 1$. The graph of g has horizontal tangents at $x = -3, 0$ and 2.



The number of points on the graph of h where there are horizontal tangent lines is

(A) 3 (B) 4 (C) 5 (D) 6 (E) 7

Ans