C2 Jan 2007 ①

1) $a = 15$ $a + 19d = 72$ (20th)
so $d = 3$ ①

4) $S_{100} = \frac{100}{2}(2\times15 + 99\times3) = 16350$ ②

2) i) $Dr\frac{\pi}{180}$ $46^\circ = \frac{46\pi}{180} = 0.803$ ②

ii) $l = r\theta = 8\times0.803 = 6.4\text{cm}$ ①

iii) $A = \frac{1}{2}r^2\theta = \frac{1}{2}\times8^2\times0.803$
$= 25.7\text{cm}^2$ ②

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3) $\int 4x - 5\,dx = 2x^2 - 5x + C$ ②

ii) $y = 2x^2 - 5x + C$ ①
$x = 3$ $y = 7$
$7 = 18 - 15 + C$ $C = 4$ ①
$y = 2x^2 - 5x + 4$ ①

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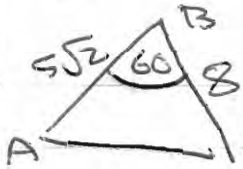
4) 

$A = \frac{1}{2}\times5\sqrt{2}\times8\times\sin60$ ①
$= \frac{1}{2}5\sqrt{2}\times8\times\frac{\sqrt{3}}{2}$ ②
$= 10\sqrt{6}$

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ii) $AC^2 = (5\sqrt{2})^2 + 8^2 - 2\times5\sqrt{2}\times8\cos60$ ②
$AC^2 = 57.43$
$AC = 7.58$ ①

5) i) $\log_3\left(\frac{4x+7}{x}\right)$ ①

ii) $\log_3\left(\frac{4x+7}{x}\right) = 2$
$3^2 = \frac{4x+7}{x}$ ② ①
$4x + 7 = 9x$ $x = 1.4$

8

5 ii)

x	3	6	9
$y = \log_{10}x$	0.4771	0.7782	0.9542

$\text{Area} = \frac{3}{2}\left(0.4771 + 0.9542 + 2(0.7782)\right)$
$= 4.48$ ③

6) $(1+4x)^7$ $x = 4x$ $n = 7$
$= 1 + 7\times4x + \frac{7\times6}{2}(4x)^2 + \frac{7\times6\times5}{6}(4x)^3$
$= 1 + 28x + 336x^2 + 2240x^3$ ④

ii) coeff x^2
$= 3\times336x^2 + a\times(28x^2)$ ①
$= 28ax^2 + 1008x^2 = 1001x^2$
$28a + 1008 = 1001$
$a = -\frac{1}{4}$ ②

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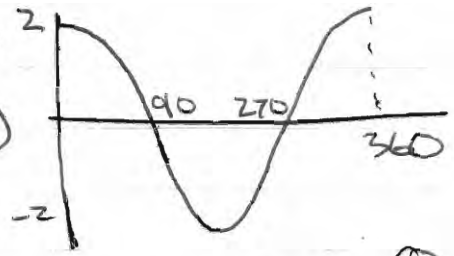
7) i a)



②

b) $\cos x = 0.4$ ① ②
$x = 66.4, 293.6$

ii) $2\cos x = \sin x$
$2 = \tan x$ ① $t = \frac{5}{c}$
$x = 63.4^\circ; 116.6^\circ$ ②

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8 $f(-2) = -8-36-14+33 = -25$ (1)

$R = -25$ (2)

11) $f(3) = 27-81+21+33 = 0$ (1)

so $x-3$ is a factor

$x-3 \overline{)\ x^3-9x^2+7x+33}$ (3)

$x^2-6x-11$

(1) x^3-3x^2

$-6x^2+7x$

$-6x^2+18x$

$-11x+33$

$-11x+33$

9

$x^2-6x-11=0$ (2)

$x = \frac{6 \pm \sqrt{80}}{2} = \frac{6 \pm \sqrt{16\times5}}{2}$

$= 3 \pm 2\sqrt{5}$

also $x=3$ from ii)

9) GP $a=1.5$ $r=1.02$

$u_5 = 1.5 \times 1.02^4$

$= 1.624$ tonnes (2)

ii) $S_n = \frac{1.5(1.02^n-1)}{1.02-1} \leq 39$ (1)

$1.02^n - 1 \leq \frac{3.39 \times .02}{1.5}$ (1)

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$1.02^n \leq 0.52+1$ (1)

$1.02^n \leq 1.52$ (1)

iii) $n \log 1.02 < \log 1.52$ (1)

$n < \frac{\log 1.52}{\log 1.02}$ (1)

$n < 21.144$ (1)

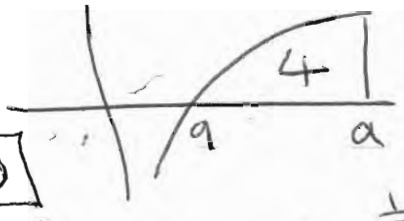
ie $n = 21$ trips (1)

10) $1 - \frac{1}{x} = 0$ $y = 1 - \frac{1}{1}$

$y = 0$

so intersects at $(1,0)$

11) $A = 4 = \int_a^9 1 - 3x^{-\frac{1}{2}}\,dx$



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$A = x - \frac{3x^{\frac{1}{2}}}{\frac{1}{2}}$

$= x - 6x^{\frac{1}{2}}$ (2)

$A(a) = a - 6a^{\frac{1}{2}}$ (1)

$A(9) = 9 - 6\times 9^{\frac{1}{2}} = -9$ (1)

$a - 6a^{\frac{1}{2}} - -9 = 4$ (area) (1)

$a - 6a^{\frac{1}{2}} + 5 = 0$

$a^{\frac{1}{2}} = m$

$m^2 - 6m + 5 = 0$ (1)

$(m-1)(m-5) = 0$ (1)

$m = 1$ or 5

$a^{\frac{1}{2}} = 1$ $a^{\frac{1}{2}} = 5$

$a = 1$ $a = 5^2 = 25$ (1)

but $a > 9$ so $a = 25$ (1)