

C2 Jan 2007 ①

i) $a = 15$ $a + 19d = 72$ (20th)
 $\Rightarrow d = 3$ ①

ii) $S_{100} = \frac{100}{2}(2 \times 15 + 99 \times 3) = 16350$ ②

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

ii) $l = r\theta = 8 \times 0.803 = 6.424$ ①

iii) $A = \frac{1}{2}r^2\theta = \frac{1}{2} \times 8^2 \times 0.803 = 25.7$ ②

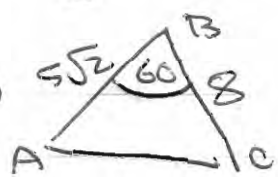
3) $\int 4x - 5 dx = 2x^2 - 5x + C$ ②

ii) $y = 2x^2 - 5x + C$ ①

if $x = 3$ $y = 7$

$7 = 18 - 15 + C$ $C = 4$ ①

$y = 2x^2 - 5x + 4$ ①

4)  $A = \frac{1}{2} \times 5\sqrt{2} \times 8 \times \sin 60^\circ$ ①

$= \frac{1}{2} \times 5\sqrt{2} \times 8 \times \frac{\sqrt{3}}{2}$ ②

$= 10\sqrt{6}$ ②

ii) $AC^2 = (5\sqrt{2})^2 + 8^2 - 2 \times 5\sqrt{2} \times 8 \cos 60^\circ$ 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

$4x+7 = 9x$ $5x = 7$ $x = 1.4$

Sii)

$x = 3 \quad 6 \quad 9$ ①
 $y = b \cdot a^x = 0.4771 \quad 0.7782 \quad 0.9542$

Area = $\frac{3}{2}(0.4771 + 0.9542 + 2(0.7782))$

$= 4.48$ ③

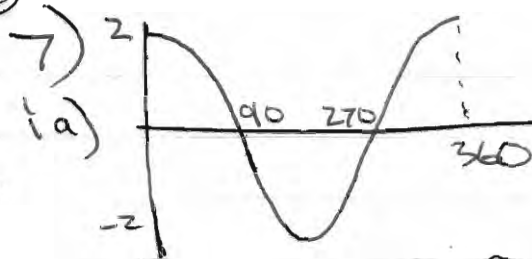
6) $(1+4x)^7$ $x = 4x$ $n = 7$

$= 1 + 7 + 4x + \frac{7 \times 6}{2}(4x)^2 + \frac{7 \times 6 \times 5}{6}(4x)^3$
 $= 1 + 28x + 336x^2 + 2240x^3$ ④

ii) coeff x^2
 $= 3 \times 336x^2 + ax(28x^2)$ ①
 $= 28ax^2 + 1008x^2 = 1001x^2$

$\Rightarrow 28a + 1008 = 1001$

$a = -\frac{1}{4}$ ②



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

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

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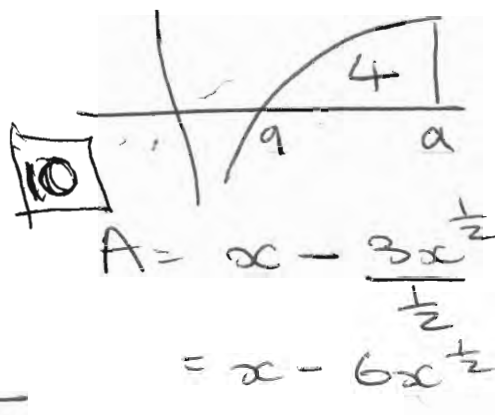
8 $f(-2) = -8 - 36 - 14 + 33 = -25$ 10) $\sqrt{x} = a$ $y = 1 - \frac{3}{\sqrt{a}} = 0$
 $R = -25$ (2) (1)

ii) $f(3) = 27 - 81 + 21 + 33 = 0$ (1) so intersects at $(9, 0)$ (1)
 so $x=3$ is a factor

$x^2 - 6x - 11$ (3)
 $x^3 - 9x^2 + 7x + 33$

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

(1) $x^3 - 3x^2$
 $-6x^2 + 7x$
 $-6x^2 + 18x$
 $+11x + 33$
 $-11x + 33$



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$x^2 - 6x - 11 = 0$ (2)
 $x = \frac{6 \pm \sqrt{80}}{2} = \frac{6 \pm \sqrt{16 \times 5}}{2}$

$= 3 \pm 2\sqrt{5}$
 also $x=3$ from ii)

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

$a - 6a^{\frac{1}{2}} - (-9) = 4$ (area) (1)
 $a - 6a^{\frac{1}{2}} + 9 = 0$ (1)

$a^{\frac{1}{2}} = m$
 $m^2 - 6m + 9 = 0$ (1)
 $(m-3)^2 = 0$ (1)

$m = 1$ or 3
 $a^{\frac{1}{2}} = 1$ $a^{\frac{1}{2}} = 3$
 $a = 1$ $a = 9$ (1)

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

9) GP $a = 1.5$ $r = 1.02$
 $U_5 = 1.5 \times 1.02^4$
 $= 1.624$ tonnes (2)

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

$1.02^n - 1 \leq \frac{3 \cdot 39 \times 0.02}{1.5}$ (1)

$1.02^n \leq 0.52 + 1$ (1)
 $1.02^n \leq 1.52$ (1)

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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)