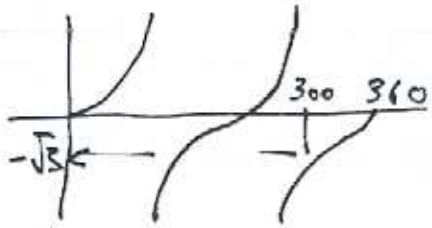
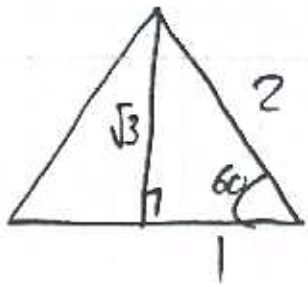
JUNE 2007 C2 SECT. A.

① (i) $\tan 300°$





$\tan 60° = \sqrt{3}$

$\tan 300° = -\sqrt{3}$

① (ii) $360° = 2\pi$ rads

$1° = \frac{2\pi}{360}$ rads $\left(\frac{\pi}{180}\right)$

So $300° = 300 \times \frac{\pi}{180} = \frac{5\pi}{3}$

② $y = 6x^{3/2}$

$\frac{dy}{dx} = 6 \times \frac{3}{2} x^{1/2} = 9x^{1/2}$ $(9\sqrt{x})$

$\frac{d^2y}{dx^2} = 9 \times \frac{1}{2} x^{-1/2} = \frac{9}{2\sqrt{x}}$

$x = 36 \quad \frac{d^2y}{dx^2} = \frac{9}{2\sqrt{36}} = \frac{9}{2 \times 6_2} = \frac{3}{4}$

③ graph B $y = 2f(x)$

graph C $y = f(x-3)$

④ $t_{n+1} = 2t_n + 5 \quad t_1 = 3$; $3, 11, 27,$

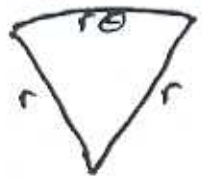
$$\sum_{1}^{3} k(k+1) = 1\times 2 + 2\times 3 + 3\times 4$$

$$= 20$$

⑤ $r = 5\text{cm}$ Area of Sector $= 9\text{cm}^2$ $\quad A = \frac{1}{2} r^2 \theta$

$$\theta = \frac{2A}{r^2} = \frac{2\times 9}{5^2} = \frac{18}{25} \text{ rad}$$

Perimeter $= 2r + r\theta = 10 + 5 \times \frac{18}{25} = 13.6\text{ cm}$



⑥ $\log_a 1 = 0$ $\quad \log_a a = 1$

$$\log_a x^{10} - 2\log_a\left(\frac{x^3}{4}\right) = 10\log_a x - 2(\log_a x^3 - \log_a 4)$$

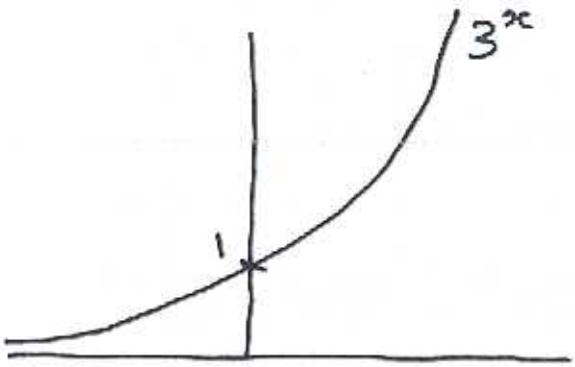
$$= 10\log_a x - 2(3\log_a x - \log_a 2^2)$$

$$= 10\log_a x - 6\log_a x + 2\log_a 2^2$$

$$= 4\log_a x + 4\log_a 2$$

$$= 4\log_a(2x) \quad \text{as reqd.}$$

7.



$$3^x = 20$$

$$\log 3^x = \log 20$$

$$x \log 3 = \log 20$$

$$x = \frac{\log 20}{\log 3} = 2.7268\ldots$$

$$x = 2.73$$

8. $2\cos^2\theta + 7\sin\theta = 5$

$\cos^2\theta + \sin^2\theta = 1 \Rightarrow \cos^2\theta = 1 - \sin^2\theta$

$2(1 - \sin^2\theta) + 7\sin\theta - 5 = 0$

$2 - 2\sin^2\theta + 7\sin\theta - 5 = 0$ (collect terms and change signs)

$2\sin^2\theta - 7\sin\theta + 3 = 0$

$(2\sin\theta - 1)(\sin\theta - 3) = 0$

$2\sin\theta = 1 \qquad \sin\theta = 3$ (NO SOLNS)

$\sin\theta = \frac{1}{2}$

$\theta = 30°$ and $150°$