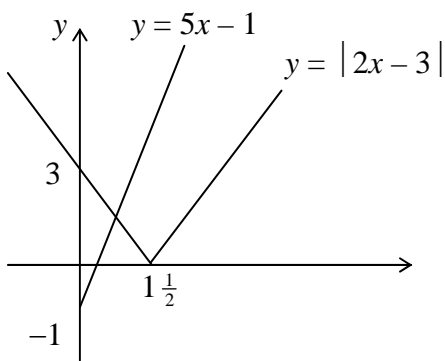
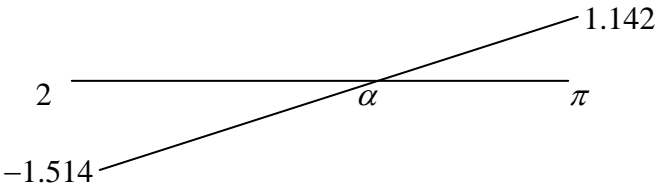


EDEXCEL PURE MATHEMATICS P4 (6671) – JANUARY 2003 PROVISIONAL MARK SCHEME

Question Number	Scheme	Marks
1.	$zw =$ $12 \left(\cos \frac{\pi}{4} \cos \frac{2\pi}{3} - \sin \frac{\pi}{4} \sin \frac{2\pi}{3} \right) + 12i \left(\sin \frac{\pi}{4} \cos \frac{2\pi}{3} + \cos \frac{\pi}{4} \sin \frac{2\pi}{3} \right)$ $= 12 \left[\cos \frac{11\pi}{12} + i \sin \frac{11\pi}{12} \right]$	<p>B1 for 12</p> <p>M1 A1</p> <p>(3 marks)</p>
2.	<p>(a)</p>  <p>(b)</p> $-2x + 3 = 5x - 1$ $x = \frac{4}{7}$ $x > \frac{4}{7}$	<p>shape B1</p> <p>points on axes B1</p> <p>(2)</p> <p>M1</p> <p>A1</p> <p>A1 ft</p> <p>(3)</p> <p>(5 marks)</p>

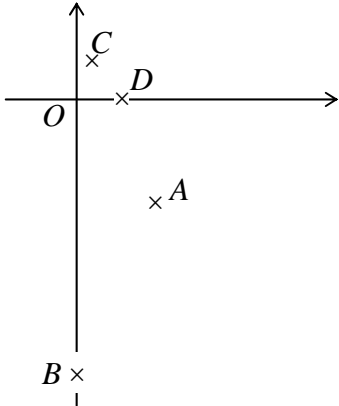
Question Number	Scheme	Marks
3. (a)	$\frac{1}{r+1} - \frac{1}{r+3}$	B1 B1 (2)
(b)	$\sum_1^n \frac{1}{r+1} - \frac{1}{r+3} = \frac{1}{2} - \cancel{\frac{1}{4}}$ $+ \frac{1}{3} - \frac{1}{5}$ $+ \cancel{\frac{1}{4}} - \cancel{\frac{1}{6}}$ \vdots $+ \cancel{\frac{1}{n}} - \frac{1}{n+2}$ $+ \cancel{\frac{1}{n+1}} - \frac{1}{n+3}$ $= \left(\frac{1}{2} + \frac{1}{3}\right) + \left(-\frac{1}{n+2} - \frac{1}{n+3}\right)$ $= \frac{5}{6} - \left(\frac{5n^2 + 25n + \cancel{30} - 12n - \cancel{30}}{6(n+2)(n+3)}\right)$ $= \frac{n(5n+13)}{6(n+2)(n+3)} \quad *$	<p>M1</p> <p>A1 A1</p> <p>M1</p> <p>A1 cso</p> <p>(5)</p>
		(7 marks)

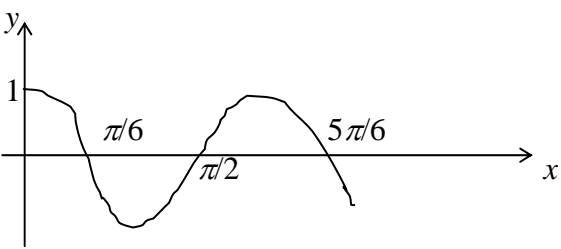
EDEXCEL PURE MATHEMATICS P4 (6671) – JANUARY 2003 PROVISIONAL MARK SCHEME

Question Number	Scheme	Marks
<p>4. (a)</p> <p>(b)</p>	<p> $f(2) = -1.514$ $f(\pi) = 1.142$ </p>  <p> $\frac{\pi - \alpha}{\alpha - 2} = \frac{1.142}{1.514}$ $\pi \times 1.514 + 2 \times 1.142 = (1.142 + 1.514)\alpha$ $\alpha = 2.65$ </p> <p> $f'(x) = 4 \cos 2x + 1$ $f(2.8) = -0.4625$ $f'(2.8) = 4.1023$ $x_2 = 2.8 - \frac{(-0.4625)}{4.1023}$ $= 2.91$ only </p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>(9 marks)</p>
	<p> $k \cos 2x + c$ </p> <p>(4)</p>	<p>(4)</p>

EDEXCEL PURE MATHEMATICS P4 (6671) – JANUARY 2003 PROVISIONAL MARK SCHEME

Question Number	Scheme	Marks
5.	(a) $v + x \frac{dv}{dx} = (4 + v)(1 + v)$	M1, M1
	$x \frac{dv}{dx} = v^2 + 5v + 4 - v$	A1
	$x \frac{dv}{dx} = (v + 2)^2 \quad *$	A1 (4)
	(b) $\int \frac{1}{(v + 2)^2} dv = \int \frac{1}{x} dx$	B1, M1
	$-\frac{1}{2 + v} = \ln x + c$	M1 A1 must have + c
	$2 + v = -\frac{1}{\ln x + c}$	M1
	$v = -\frac{1}{\ln x + c} - 2$	A1 (5)
(c)	$y = -2x - \frac{x}{\ln x + c}$	B1 (1) (10 marks)

Question Number	Scheme	Marks
6. (a)	$z^2 = (3 - 3i)(3 - 3i) = -18i$	M1 A1 (2)
6. (b)	$\frac{1}{z} = \frac{(3 + 3i)}{(3 - 3i)(3 + 3i)} = \frac{3 + 3i}{18} = \frac{1 + i}{6}$	M1 A1 (2)
6. (c)	$ z = \sqrt{9 + 9} = \sqrt{18} = 3\sqrt{2}$	
	$ z = 18$	two correct M1
	$\left \frac{1}{z}\right = \sqrt{\frac{1}{18}} = \frac{1}{3\sqrt{2}} = \frac{\sqrt{2}}{6}$	all three correct A1 (2)
6. (d)		two correct B1
6. (e)	$\frac{OB}{OD} = 18, \quad \frac{OA}{OC} = \frac{3\sqrt{2}}{\sqrt{2}/6} = 18$	M1 A1
	$\angle AOB = \angle COD = 45 \therefore$ similar	B1 (3)
		(11 marks)

Question Number	Scheme	Marks
7.	<p>(a) $y = \lambda x \cos 3x$</p> $\frac{dy}{dx} = \lambda \cos 3x - 3\lambda x \sin 3x$ $\frac{d^2y}{dx^2} = -3\lambda \sin 3x - 3\lambda \sin 3x - 9\lambda x \cos 3x$ $\therefore -6\lambda \sin 3x - 9\lambda x \cos 3x + 9\lambda x \cos 3x = -12 \sin 3x$ $\lambda = 2$ <p>(b) $\lambda^2 - 9 = 0$</p> $\lambda = (\pm)3i$ $\therefore y = A \sin 3x + B \cos 3x$ $\therefore y = A \sin 3x + B \cos 3x + 2x \cos 3x$ <p>(c) $y = 1, x = 0 \Rightarrow B = 1$</p> $\frac{dy}{dx} = 3A \cos 3x - 3B \sin 3x + 2 \cos 3x - 6x \sin 3x$ $2 = 3A + 2 \Rightarrow A = 0$ $\therefore y = \cos 3x + 2x \cos 3x$ <p>(d) </p>	<p>M1 A1</p> <p>A1</p> <p>cso A1 (4)</p> <p>M1</p> <p>A1</p> <p>form M1</p> <p>A1 ft on λ's (4)</p> <p>B1</p> <p>M1 A1 ft on λ's</p> <p>A1 (4)</p> <p>axes shape B1 B1 (2)</p> <p>(14 marks)</p>

Question Number	Scheme	Marks
8. (a)	$\frac{1}{2}a^2 \int 1 + \cos^2 \theta + 2 \cos \theta \, d\theta$ $= \frac{1}{2}a^2 \int 1 + \frac{\cos 2\theta + 1}{2} + 2 \cos \theta \, d\theta$ $= 2 \times \frac{1}{2}a^2 \left[\theta + \frac{\sin 2\theta}{4} + \frac{\theta}{2} + 2 \sin \theta \right]_0^\pi$ $= a^2 \left[\frac{3\pi}{2} \right] = \frac{3\pi a^2}{2}$	M1 A1 correct with limits M1 A1 A1 A1 (6)
(b)	$x = a \cos \theta + a \cos^2 \theta$ $\frac{dx}{d\theta} = -a \sin \theta - 2a \cos \theta \sin \theta$ $\frac{dx}{d\theta} = 0 \Rightarrow \cos \theta = -\frac{1}{2}$ $\theta = \frac{2\pi}{3} \text{ or } \theta = \frac{4\pi}{3}$ $r = \frac{a}{2} \text{ or } r = \frac{a}{2}$ $A: r = \frac{a}{2}, \theta = \frac{2\pi}{3}$ $B: r = \frac{a}{2}, \theta = \frac{-2\pi}{3}$	$r \cos \theta$ M1 A1 finding θ M1 finding r M1 both A and B A1 (5)
(c)	$x = -\frac{1}{4}a \quad \therefore WX = 2a + \frac{1}{4}a = 2\frac{1}{4}a$	M1 A1
(d)	$WXYZ = \frac{27\sqrt{3}a^2}{8}$	B1 ft (1)
(e)	$\text{Area} = \frac{27\sqrt{3}}{8} \times 100 - \frac{3\pi \times 100}{2} = 113.3 \text{ cm}^2$	M1 A1 (2) (16 marks)