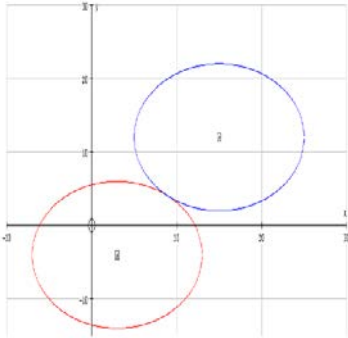


Question number	Scheme	Marks
<p>1. (a)</p> <p>(b)</p>	<p>$f(-3) = -27 - 27 + 30 + 24 = 0 \Rightarrow (x + 3)$ is factor</p> <p>$(x + 3)(x^2 - 6x + 8)$</p> <p>$(x + 3)(x - 2)(x - 4)$</p>	<p>M1 A1 (2)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>(6 marks)</p>
<p>2. (a)</p> <p>(b)</p>	<p>$4x + 9, +12\sqrt{x}$</p> <p>$\int (4x + 12x^{1/2} + 9) dx = 2x^2 + 8x^{3/2} + 9x$ (dep. on 3 terms)</p> <p>$[.....]_1^2 = (8 + (8 \times 2^{3/2}) + 18) - (2 + 8 + 9)$</p> <p>$= 7 + 16\sqrt{2}$</p>	<p>B1, B1 (2)</p> <p>M1 A1</p> <p>M1</p> <p>M1 A1 (5)</p> <p>(6 marks)</p>
<p>3.</p>	<p>$(1 + px)^n \equiv 1 + np x, + \frac{n(n-1)p^2 x^2}{2} + \dots$</p> <p>Comparing coefficients: $np = -18, \frac{n(n-1)}{2} = 36$</p> <p>Solving $n(n-1) = 72$ to give $n = 9; p = -2$</p>	<p>B1, B1</p> <p>M1, A1</p> <p>M1 A1; A1 ft</p> <p>(7 marks)</p>
<p>4. (a)</p> <p>(b)</p>	<p>Centre is at (3,-4)</p> <p>radius = $\sqrt{(3^2 + (-4)^2 - -75)} = 10$</p> <p>1st circle</p> <p>2nd circle</p> <p>Circles touching</p> <p>At (9, 4)</p> 	<p>B1</p> <p>M1 A1 (3)</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1 (4)</p> <p>(7 marks)</p>

Question number	Scheme	Marks
5. (i)	Divide: $1 + 2x^{-1}$ Differentiate: $6x^2 + \frac{1}{2}x^{-\frac{1}{2}} - 2x^{-2}$	M1 A1 M1 A2 (1,0) (5)
(ii)	$\frac{x^2}{4} + \frac{x^{-1}}{-1}$ $[]^4 - []_1 = \left(4 - \frac{1}{4}\right) - \left(\frac{1}{4} - 1\right) = 4\frac{1}{2}$	M1 A1A1 M1 A1 (5) (10 marks)
6. (a)	$\frac{a}{1-r} = \frac{1200}{1-r} = 960$ $960(1-r) = 1200$	M1 A1 A1 (3)
(b)	$r = -\frac{1}{4}$ (*) $T_9 = 1200 \times (-0.25)^8$ (or T_{10}) Difference = $T_9 - T_{10} = 0.0183105\dots - (-0.0045776\dots)$ $= 0.023$ (or -0.023)	M1 M1 A1 (3)
(c)	$S_n = \frac{1200(1 - (-0.25)^n)}{1 - (-0.25)}$	M1 A1 (2)
(d)	Since n is odd, $(-0.25)^n$ is negative, so $S_n = 960(1 + 0.25^n)$ (*)	M1 A1 (2) (10 marks)

Question number	Scheme	Marks
<p>7. (a)</p> <p>(b)</p> <p>(c)</p>	$\frac{dC}{dv} = -160v^{-2} + \frac{2v}{100}$ $-160v^{-2} + \frac{2v}{100} = 0$ $v^3 = 8\,000 \qquad v = 20$ $\frac{d^2C}{dv^2} = 320v^{-3} + \frac{1}{50}$ <p>> 0, therefore minimum</p> $v = 20 : C = \frac{160}{20} + \frac{400}{100} = 12$ <p>Cost = 250 × 12 = £30</p>	<p>M1 A1</p> <p>M1</p> <p>M1 A1 (5)</p> <p>M1</p> <p>A1 (2)</p> <p>B1ft</p> <p>M1 A1 (3)</p> <p>(10 marks)</p>
<p>8. (a)</p> <p>(b)</p> <p>Tangent:</p> <p>(c)</p> <p>(d)</p>	<p>A: y = 1 B: y = 4</p> $\frac{dy}{dx} = \frac{2x}{25} = \frac{2}{5} \text{ where } x = 5$ $y - 1 = \frac{2}{5}(x - 5) \qquad (5y = 2x - 5)$ $x = 5y^{\frac{1}{2}}$ <p>Integrate: $\frac{5y^{\frac{3}{2}}}{\frac{3}{2}} \left(= \frac{10y^{\frac{3}{2}}}{3} \right)$</p> $[]^4 - []_1 = \left(\frac{10 \times 4^{\frac{3}{2}}}{3} \right) - \left(\frac{10 \times 1^{\frac{3}{2}}}{3} \right), = \frac{70}{3} \quad (23\frac{1}{3}, 23.3)$	<p>B1 (1)</p> <p>M1 A1</p> <p>M1 A1 (4)</p> <p>B1 B1 (2)</p> <p>M1 A1ft</p> <p>M1 A1, A1 (5)</p> <p>(12 marks)</p>

Question number	Scheme	Marks
9. (i)	$\arcsin 0.6 = 36.9^\circ$ (awrt) α $2x + 50 = 36.87, \quad 2x = -13.13^\circ + 360^\circ = 346.87^\circ$ $2x + 50 + 180 - 36.87, \quad 2x = 143.13^\circ - 50^\circ = 93.13^\circ$ $x = 46.6, \quad 173.4$	B1 M1 M1 M1 M1 A1 A1 (7)
(ii) (a)	$\sin 60^\circ = \frac{\sqrt{3}}{2}, \quad \frac{BC}{\left(\frac{1}{3}\right)} = \frac{18}{\sin 60^\circ}$ $BC = 6 \div \frac{\sqrt{3}}{2} \quad BC = \frac{12}{\sqrt{3}} = 4\sqrt{3}$ (*)	B1, M1 M1 A1 (4)
(b)	$\cos^2 \theta = 1 - \sin^2 \theta = 1 - \frac{1}{9}$ $\sin \theta = \sqrt{\frac{8}{9}} \quad \left(= \frac{\sqrt{8}}{3} = \frac{2\sqrt{2}}{3} \right)$	M1 A1 (2) (13 marks)