1. a) $6(1-x^2)^5 \times (-2x)$ — M1 M1 (dep)

b) $x^3 \times 3\cos 3x + 3x^2 \times \sin 3x$ — B1 (sensible attempt at product rule); M1 M1

c) $\dfrac{(x^3+2) \times 5 - 5x(3x^3)}{(x^3+2)^2}$ — M3 dep on dr cont attempt at quotient rule

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2. Use $\sec "2x" = \dfrac{1}{\cos "2x"}$ — B1

$\cos 2x = 1 - 2\sin^2 2x$ — B1

$1 - 2\left(\frac{3}{5}\right)^2$ — M1

$1 - \frac{18}{25}$ & succesful conclusion — A1

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3. $x^2 - 2x - 4 = 4$ — B1

$x^2 - 2x - 4 = -4$ — B1

$(x-4)(x+2)$ OR $x(x-2)$ — M1

$x = -2, 4, 0, 2$ — A2

4. a) $f(0.7) = -0.13265$
$f(0.8) = 0.04793$ } BOTH ATTEMPTED M1

CHANGE OF SIGN (AND CONTINUITY) IMPLIES BOT... E1

b) $x = \frac{1}{4} + \frac{3}{4}\sin x$ OR $x_{n+1} = \frac{1}{4} + \frac{3}{4}\sin x_n$
OR $A = \frac{1}{4}, B = \frac{3}{4}$ M1

$x_2 = 0.76123$ —
$x_3 = 0.76739$ —
$x_4 = 0.77068$ —
$x_5 = 0.77247$ — A3 -1 eeoo

c) ATTEMPTS $f(0.7745)$ OR $f(0.7755)$ OR "TIGHTER" M1

0.000076 OR 0.0017804 SEEN A1

$0.7745 < r < 0.7755$ + CONCLUSION E1

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5. a) $\simeq 205$ A1

b) 400 A1

c) $1000 = 400e^{\frac{1}{12}(t-12)}$ M1

$\frac{5}{2} = e^{\frac{1}{12}(t-12)}$ M1

$\ln\frac{5}{2} = \frac{1}{12}(t-12)$ M1

$t = 8 + 12\ln\frac{5}{2}$ OR 18.995... A1
OR 19

6. REFLECTION IN THE x AXIS SEEN OR IMPLIED, MUST "TOUCH" x AXIS B1

TRANSLATION "LEFT" SEEN OR IMPLIED B1

$(-7,0)$ & $(-1,0)$ (BOTH) A1

$(-5,8)$ A1

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7. $2(2\cos^2\theta - 1) = 4\cos\theta - 3$ M1

$4\cos^2\theta - 4\cos\theta + 1 = 0$ O.E. M1

$(2\cos\theta - 1)^2 = 0$ O.E M1

$\cos\theta = \frac{1}{2}$ A1

$\theta = 60$ A1

$\theta = 300$ A1

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8. a) $\frac{2(2x-1)-6}{(x-2)(2x-1)}$ M1

$\frac{4x-8}{(x-2)(2x-1)}$ M1

$\frac{4(x-2)}{(x-2)(2x-1)}$ M1

CANCELS OR STATES ANSWER A1 ↑ dep

b) $x = \frac{1}{2}$ C.A.O B1

c) $0 < f(x) < 4$ M1 M1

d) $2xy - y = 4$ OR $2x - 1 = \frac{4}{y}$ M1

$x = \frac{y+4}{2y}$ OR $x = \frac{1}{2}\left(\frac{4}{y} + 1\right)$ O.E M1

$f^{-1}(x) = \frac{y+4}{2y}$ OR $f'(x) = \frac{2}{y} + \frac{1}{2}$ O.E A1

e) $0 < x < 4$ A1 ft (b) $f'(x) > 1$ A1

9. a) $\frac{dy}{dx} = \frac{(4x-k)\times 4 - (4x+k)\times 4}{(4x-k)^2}$ M3 dep on correct quotient rule structure

$\frac{16x-4k-16x-4k}{(4x-k)^2}$ M1

$-\frac{8k}{(4x-8)^2}$ OR SIMILAR A1

b) $\frac{-8k}{(12-k)^2} = \frac{8}{27}$ M1

SIMPLIFIES TO "NON DENOMINATOR EXPRESSION" (DECENT ATTEMPT) M1

$k^2 - 51k + 144 = 0$ A1

$(k-48)(k-3) = 0$ M1

$k = 3, 48$ BOTH A1

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10. a) $\sin 2x\cos x + \cos 2x \sin x$ M1

$(2\sin x\cos x)\cos x + (1-2\sin^2 x)\sin x$ M2

$2\sin x\cos^2 x + \sin x - 2\sin^3 x$ M1

$2\sin x(1-\sin^2 x) + \sin x - 2\sin^3 x$ M1

$2\sin x - 2\sin^3 x + \sin x - 2\sin^3 x$ + ANSWER A1

b) $3\cos 3x = 3\cos x - 12\sin^2 x\cos x$ M2

USE OF $1-\cos^2 x$ INTO ↗ M1

OR $\begin{pmatrix} 3\cos 3x = 3\cos x - 12\cos x + 12\cos^3 x \\ \cos 3x = \cos x - 4\cos x + 4\cos^3 x \end{pmatrix}$ M1

$\cos 3x = 4\cos^3 x - 3\cos x$ A1