

1. a) $3(-2)^3 - 2(-2)^2 - 12(-2) + 8$ OR $-24 - 8 + 24 - 8$ M1

OBTAINS ZERO & CONCLUDES E1

b) $(x+2)(3x^2 - 8x + 4)$ A1

$(3x-2)(x-2)$ A2

2. $\binom{5}{0}(3)^5(2x)^0 + \binom{5}{1}(3)^4(2x)^1 + \binom{5}{2}(3)^3(2x)^2 + \binom{5}{3}(3)^2(2x)^3$ M1

OR SIMILAR
ALLOW MINOR ERRORS

$243 - 810x + 1080x^2 - 720x^3$ B4

3 a) $\frac{3}{4}$ O.E. A1

b) $108 \times \frac{3}{4}$ M1

81 A1

ALTERNATIVE $a = \frac{144}{0.75^2}$ M1
OR 256×0.75^4 M1
OBTAINS 81 A1

c) INDICATES $a = 256$ MAY APPEAR IN (b) B1

$\frac{256}{1 - 0.75}$ M1 A1

1024 A1 c.a.o

4. $\frac{dy}{dx} = 2 - 16x^{-3}$ o.E BI

$\frac{d^2y}{dx^2} = 48x^{-4}$ o.E BI

$2 - 16x^{-3} = 0$ OR SIMILAR MI

OBTAINS $x=2$ ONLY

$y=6$ OR $(2,6)$

SUBSTITUTES INTO $\left. \frac{d^2y}{dx^2} \right|_{x=2}$ OR $\frac{48}{2^4}$ OR $\frac{48}{16}$ MI ~~+~~ ~~+~~

OBTAINS 3, STAYS >0 \Rightarrow (LOCAL) MINIMUM E₁
(POSITIVE)

5. a) 4.899 BI c.a.o

6.275 BI c.a.a

b) $\frac{0.5}{2} \left[7.746 + 2(1.369 + 2.444 + 3.623 + 4.899 + 6.275) \right]$ BI
BI BI ~~+~~ DEF

11.24 AI c.a.o

6. $\log_5 w^2$ BI

$\log_5 \frac{4-w}{w^2}$ BI

$\frac{4-w}{w^2} = 5$ AI

$5w^2 + w - 4$ M1

$(5w-4)(w+1)$ M1

Roots $\frac{4}{5}$ -1 AI

CROSSES -1 OR INDICATES $\frac{4}{5}$ ONLY AI

7. a) ATTEMPTS COSINE RULE, ALLOW 1 MINOR ERROR M1

$64 + 36 - 96 \cos 1.2$ O.E M1

8.08 (a.w.r.t) AI

b) $\frac{1}{2} \times 8 \times 6 \times \sin 1.2^c$ M1

22.4 (a.w.r.t) AI

c) $\frac{1}{2} \times 4^2 \times 1.2$ OR 9.6 M1

"22.4" - "9.6" M1

12.8 (a.w.r.t) AI

d) 4×1.2 OR 4.8 M1

18.9 (a.w.r.t) AI

8. $4x - x^2 = 0$ M1
 "STATES THAT" (4,0) A1
 $3x - 6 = 4x - x^2$ M1
 $(x-3)(x+2)$ M1
 INDICATES THAT B IS (3,3) A1
 INDICATES Q IS (2,0) B1

AREA OF TRIANGLE IS $\frac{3}{2}$ OR $\frac{1}{2} \times 1 \times \frac{3}{2}$ M1

$$\int_3^4 4x - x^2 dx = (32 - \frac{64}{3}) - (18 - 9) = \frac{5}{3}$$

M2 (1 MARK FOR LIMITS) M1 A1

$$\frac{3}{2} + \frac{5}{3} = \frac{19}{6}$$

A1

dep attempt on "their limits"

9. a) ATTEMPTS TO COMPLETE THE SQUARE SANSIBLY M1

(5, 4) A2

RADIUS = $\sqrt{20}$ A1

- b) $\sqrt{20} > 4$ CROSSES x AXIS B1
 $\sqrt{20} < 5$ DOESN'T CROSS y AXIS B1

ACCEPT CORRECT SKETCH

- c) ATTEMPTS SIMULTANEOUS EQUATIONS M1

$5x^2 - 10x + 5$ OR $x^2 - 2x + 1$ OR $y^2 - 12y + 36$ A1

$(x-1)^2$ OR $(y-6)^2$ A1

REPEATED ROOT, SO TANGENT (O.E) E1

STATES (1,6) A1

$$10. \quad \sin\left(3x + \frac{\pi}{4}\right) = -\frac{\sqrt{3}}{2} \quad A1$$

$$3x + \frac{\pi}{4} = \left(-\frac{\pi}{3}\right) \quad M1 \quad A1$$

$$3x + \frac{\pi}{4} = \frac{4\pi}{3} \quad A1$$

$$-\frac{7\pi}{36} \text{ seen} \quad B1$$

$$\frac{17\pi}{36} \quad \frac{13\pi}{36} \quad \text{1 more EXTRA} \quad A1 \quad A1$$