

$$\textcircled{1} \quad y = \frac{\sqrt{x} - 1}{\sqrt{x}} = \frac{\sqrt{x}}{\sqrt{x}} - \frac{1}{\sqrt{x}} = 1 - x^{-1/2}$$

BI

$$\frac{dy}{dx} = \frac{1}{2} x^{-3/2}$$

MIAI

$$\text{if } x=9, \frac{dy}{dx} = \frac{1}{2} (9)^{-3/2} = \frac{1}{2} (3)^{-3} = \frac{1}{2} \times \frac{1}{27} = \frac{1}{54}$$

AI

$\textcircled{4}$

$$\begin{aligned} \textcircled{2} \quad \int_0^4 x^{1/2} (2x-3) dx &= \int_0^4 2x^{3/2} - 3x^{1/2} dx \\ &= \left[\frac{4}{5} x^{5/2} - 2x^{3/2} \right]_0^4 \\ &= \frac{4}{5} (4)^{5/2} - 2(4)^{3/2} - 0 \\ &= \frac{4}{5} \times 32 - 2 \times 8 = \frac{48}{5} \end{aligned}$$

BI

MIAI

AI

$\textcircled{4}$

$$\textcircled{3} \quad \text{a) } \log_4 (x+3) - \log_4 x = 3$$

$$\therefore \log_4 \frac{x+3}{x} = 3$$

MIAI

$$\therefore \frac{x+3}{x} = 4^3$$

BI

$$\therefore x+3 = 64x$$

$$\therefore 63x = 3$$

$$\therefore x = \frac{1}{21}$$

AI

$\textcircled{4}$

$$\text{b) } (\ln x)^2 + 2 \ln x - 15 = 0$$

$$\text{Let } y = \ln x$$

$$\therefore y^2 + 2y - 15 = 0$$

$$\therefore (y+5)(y-3) = 0$$

MIAI

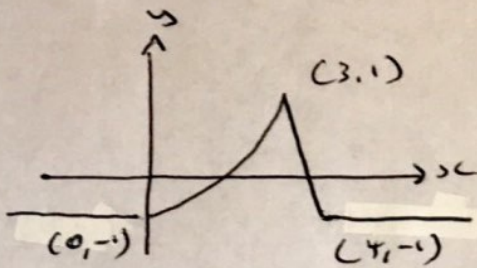
$$\therefore y = -5 \text{ or } 3$$

$\textcircled{4}$

$$\therefore \ln x = -5 \text{ or } \ln x = 3 \quad \therefore x = e^{-5} \text{ or } e^3 \quad \text{MIAI}$$

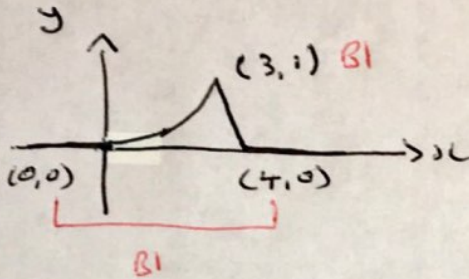
$\textcircled{8}$

4 a)



----- B1
 ↓ B1

b)



4

5

$$2 \sin 2\theta + \cos \theta = 0$$

$$\therefore 4 \sin \theta \cos \theta + \cos \theta = 0$$

$$\therefore \cos \theta (4 \sin \theta + 1) = 0$$

$$\therefore \cos \theta = 0 \text{ or } \sin \theta = -\frac{1}{4}$$

$$\therefore \theta = \frac{\pi}{2}, \frac{3\pi}{2}, 3.39\dots, 6.03\dots$$

B1

M1 A1

2 correct A1
 4 correct A1

5

6

$$\text{LHS} \equiv \frac{\sin \theta (1 + \cos \theta) + \sin \theta (1 - \cos \theta)}{1 - \cos^2 \theta}$$

M1

$$\equiv \frac{2 \sin \theta}{\sin^2 \theta}$$

M1

$$\equiv \frac{2}{\sin \theta}$$

M1

$$\equiv 2 \csc \theta \equiv \text{RHS} \quad \text{Q.E.D.}$$

A1

4

$$\textcircled{7} \quad a) \quad 3 \sec^2(3x+1)$$

MIAI

$$b) \quad 3 \frac{(2-x) - (-1)(3x-1)}{(2-x)^2}$$

MIAI

$$= \frac{6-3x+3x-1}{(2-x)^2}$$

$$= \frac{5}{(2-x)^2}$$

A1

$$c) \quad \frac{1}{2} x^{-1/2} e^{3x} + 3x^{1/2} e^{3x}$$

MIAI

$$= e^{3x} \left(\frac{1}{2} x^{-1/2} + 3x^{1/2} \right)$$

A1

$$= \frac{1}{2} e^{3x} (x^{-1/2} + 6x^{1/2})$$

$$= \frac{1}{2} e^{3x} \left(\frac{1}{\sqrt{x}} + 6\sqrt{x} \right)$$

$$= \frac{1}{2} e^{3x} \left(\frac{1+6x}{\sqrt{x}} \right)$$

$$= \frac{e^{3x}}{2\sqrt{x}} (1+6x)$$

8) a) $G = (4x^2 - 5)^9$

$D = 9(4x^2 - 5)^8 \cdot 8x = 72x(4x^2 - 5)^8$

A $\frac{1}{24} (4x^2 - 5)^9 + C$

MIAI

b) $3 \sec x - 2 \ln x + C$

MIMAI
must have +C

c) $\frac{-x-5}{(x+1)(x-3)} = \frac{A}{x+1} + \frac{B}{x-3}$

$\therefore -x-5 = A(x-3) + B(x+1)$

$x=3 \Rightarrow -8 = 4B \Rightarrow B = -2$

$x=-1 \Rightarrow -4 = -4A \Rightarrow A = 1$

MIAAI

$\int \frac{1}{x+1} + \frac{-2}{x-3} dx$

$= \ln|x+1| - 2 \ln|x-3| + C$

AI (9)

9) $(2-x)^{-2} = (2(1-\frac{x}{2}))^{-2} = \frac{1}{4} (1-\frac{x}{2})^{-2}$ MI

$= \frac{1}{4} \left[1 + (-2)(-\frac{x}{2}) + \frac{(-2)(-3)}{2!} (\frac{-x}{2})^2 + \dots \right]$ MIAI

$= \frac{1}{4} \left[1 + x + \frac{3}{4} x^2 + \dots \right]$

$= \frac{1}{4} + \frac{1}{4} x + \frac{3}{16} x^2$

AI (4)

(10)
$$d_y = \sqrt{\frac{176.84}{100} - \left(\frac{131}{100}\right)^2}$$
 MI

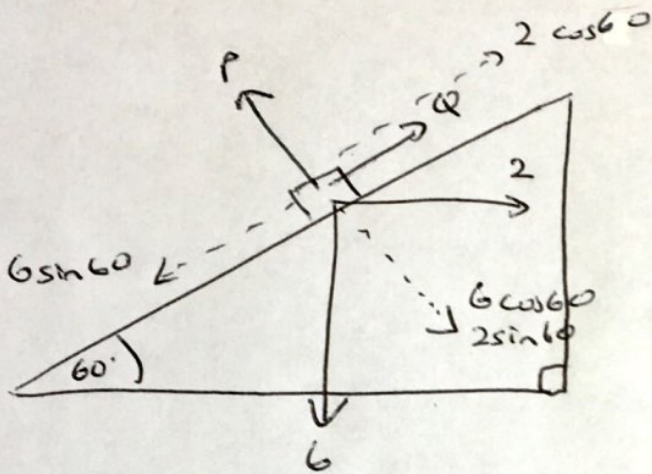
$$= 0.229$$
 AI

but $d_y = 0.01 d_c$ MI

$\therefore d_c = 22.9$ AI

(4)

(11)



$Q + 2 \cos 60 = 6 \sin 60$ MIAI
 $\therefore Q = 4.20 (= 3\sqrt{3} - 1)$ AI

$P = 6 \cos 60 + 2 \sin 60$ MIAI
 $= 4.73 (= 3 + \sqrt{3})$ AI

(6)

A*	A	B	C	D	E	
60	53 = 88	47 = 78	41 = 68	35 = 58	29 = 48	23 = 38
59 = 98	52 = 87	46 = 77	40 = 67	34 = 57	28 = 47	22 = 37
58 = 97	51 = 85	45 = 75	39 = 65	33 = 55	27 = 46	21 = 35
57 = 95	50 = 84	44 = 73	38 = 63	32 = 53	26 = 45	20 = 35
56 = 94	49 = 82	43 = 72	37 = 62	31 = 52	25 = 44	19 = 32
55 = 92	48 = 80	42 = 70	36 = 60	30 = 50	24 = 42	18 = 30
54 = 90						17 = 28
						16 = 27