C1

(1) $\frac{5}{7} + \frac{4}{7}\sqrt{2}$

(2a) 2^{4x}

(2b) $x = 0$ or 4

(3) $x + 3y - 22 = 0$

(4a)
$$\overline{AB} = 8 - 5 = 3$$
$$\overline{AC} = 5 - 1 = 4$$
$$\overline{BC} = \sqrt{(8-5)^2 + (1-5)^2}$$
$$= \sqrt{3^2 + 4^2}$$
$$BC^2 = 3^2 + 4^2$$
$$BC^2 = AB^2 + AC^2$$

(4b) Radius = 2.5m
Centre = (6.5, 3)

(4c) $(x - 6.5)^2 + (y - 3)^2 = 2.5^2$

(5a) $C \rightarrow y = 2x^3 - x^2$

$$\frac{dy}{dx} = 6x^2 - 2x$$

At B $x = 2$ $\frac{dy}{dx} = 24 - 4 = 20$

At A $x = 1$ $\frac{dy}{dx} = 6 - 2 = 4$

$4 \times 5 = 20$. $\therefore$ at B $\frac{dy}{dx} = 5 \times A$.

(5b) $y = 20x - 28$

(6a) $x = -k \pm \sqrt{k^2+5}$

(6b) k^2+5 is always >0
ie for $\forall k \in \mathbb{R}$ $x^2+2kx-5=0$ has 2 roots

(6c) $x = \sqrt{3} \pm 2\sqrt{2}$

(7a) $3x - 5y + 2 = 0$.

(7b) $D = (1,1)$ Grad of AB $= 3/5$.
$C = (4,-4)$.

$m = \frac{(1--4)}{(1-4)} = \frac{5}{3}$ ie $-1/\text{Grad AB}$

(8a) $\frac{dy}{dx} = 2 - \frac{10}{x^2}$

(8b) $a = 5$ $b = 4$

(8c) Min.

(9a) $P = x + x + y + (y+1) + x$
$P = 3x + 2y + 1$.
$P = 10 \Rightarrow 10 = 3x + 2y + 1$.
$9 = 3x + 2y$

(9b)
$A = x^2 + \frac{1}{2}(xy)$
$55 = x(x + \frac{1}{2}y)$
$9 = 3x + 2y \Rightarrow x = \frac{9-2y}{3}$
$55 = (3 - \frac{2}{3}y)(3 - \frac{2}{3}y + \frac{1}{2}y)$
$55 = 9 - 2y + \frac{3}{2}y - 2y + \frac{4}{9}y^2 - \frac{2}{3}y$
$= 9 - 4\frac{1}{6}y + \frac{35}{18}y$
$= 9 - 2\frac{17}{18}y$.

(9b) $55 = x^2 + \frac{1}{2}xy$.

$P \Rightarrow 9 = 3x + 2y$.

$y = \frac{9-3x}{2}$.

$55 = x^2 + \frac{1}{2}x\left(\frac{9-3x}{2}\right)$.

$55 = x^2 + \frac{9x}{4} - \frac{3x^2}{4}$.

$22 = 4x^2 + 9x - 3x^2$.

$22 = x^2 + 9x$.

$x^2 + 9x - 22 = 0$.

$(x-2)(x+11)$ $x = 2$ or -11

-11 Not a valid measurement

$x = 2$

$9 = 3(2) + 2y$.

$y = 2/3$

(10) a $a = 4$ $b = -1/2$ $c = -4$.

b $(1/2, -4)$.

c Translate left 3.

d. Stretch y direction factor 3.