

Core 1 Specimen Paper.

1. i $4^{-2} = 1/4^2 = 1/16$
 ii $(2\sqrt{2})^2 = 4 \times 2 = 8$
 iii $(1^3 + 2^3 + 3^3)^{1/2} = (1+8+27)^{1/2} = 36^{1/2} = 6$.

2. i $x^2 - 8x + 3 = (x-4)^2 - 13$
 ii min Pt = $(4, -13)$.

3. i no real roots ~~disc~~ $= k^2 - 4k$
 ii \downarrow ie $k^2 - 4k < 0$
 $k(k-4) < 0$ ~~no real roots~~
 for $k(k-4) = 0$ $k = 0$ or 4 .

$$k(k-4) < 0 \quad 0 < k < 4$$

A. i $y = 4x^3 - 1 \quad \frac{dy}{dx} = 12x^2$
 ii $y = x^2(x^2 + 2) = x^4 + 2x^2 \quad \frac{dy}{dx} = 4x^3 + 4x$
 iii $y = \sqrt{x} = x^{1/2} \quad \frac{dy}{dx} = \frac{1}{2}x^{-1/2}$.

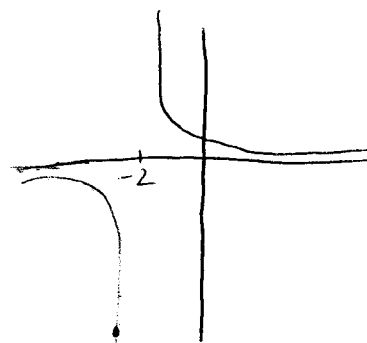
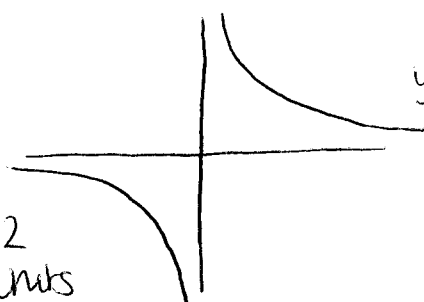
5. i $y = x^2 - 3x + 2 \quad y = 3x - 7$
 $3x - 7 = x^2 - 3x + 2$
 $0 = x^2 - 6x + 9$
 $0 = (x-3)^2 \quad \text{ie } x = 3$
 $y = 9 - 7 \quad y = 2$.

ii $y = 3x - 7$ is tangent to $y = x^2 - 3x + 2$.

iii Grad of tangent is 3 so grad of normal is $-1/3$.
 Pt(2,3) $y - 2 = -1/3(x - 3) \Rightarrow -3y + 6 = x - 3$
 $3y + x = 9$.

6. i $y = 1/x$

ii $y = 1/x \Rightarrow y = 1/(x+2)$
 x replaced by $x+2$
 So translation -2 units
 in x direction



$$\text{iii } y = \frac{1}{x} = x^{-1} \quad \frac{dy}{dx} = -x^{-2}$$

$$\text{iv } \text{Grad } y = \frac{1}{x+2} \text{ at } x=0 = \text{Grad of } y = \frac{1}{x} \text{ at } x=2$$

$$\text{When } x=2 \quad \frac{dy}{dx} = -2^{-2} = -\frac{1}{2^2} = -\frac{1}{4}$$

$$\text{7.1 } A=(2,9) \quad B=(10,3)$$

$$\text{Midpoint } AB = \text{Centre} = (6,6)$$

$$\text{Diameter} = \sqrt{8^2 + 6^2} = 10$$

$$\text{So radius} = 5.$$

$$\begin{aligned} \text{ii Eqn is } (x-6)^2 + (y-6)^2 &= 25 \\ &= x^2 - 12x + 36 + y^2 - 12y + 36 - 25 = 0 \\ &= x^2 + y^2 - 12x - 12y + 36 + 36 - 25 = 0 \\ &= x^2 + y^2 - 12x - 12y + 47 = 0. \end{aligned}$$

$$\text{iii Grad of tangent} = \text{normal to } AB.$$

$$\text{Grad of } AB = \frac{-6}{8} = -\frac{3}{4} \quad \text{ie Grad of tangent} = \frac{4}{3}$$

$$\begin{aligned} y-3 &= \frac{4}{3}(x-10) \quad \text{when } y=0 \quad -3 = \frac{4}{3}(x-10) \\ -\frac{9}{4} &= x-10 \\ x &= 10 - \frac{9}{4} \\ x &= \underline{\underline{7\frac{3}{4}}} \end{aligned}$$

$$C = (7\frac{3}{4}, 0)$$

$$\text{8.1 } y = 2x^3 - 3x^2 - 12x - 7 \quad \frac{dy}{dx} = 6x^2 - 6x - 12$$

$$\begin{aligned} \text{Stat Point when } \frac{dy}{dx} &= 0 \quad \text{ie } 0 = 6x^2 - 6x - 12 \\ 0 &= x^2 - x - 2 \\ 0 &= (x-2)(x+1) \\ \text{ie } x &= 2 \text{ or } -1. \end{aligned}$$

$$x=2 \quad y = 16 - 12 - 24 - 7 = -27$$

$$x=-1 \quad y = -2 - 3 + 12 - 7 = 0$$

$$\text{Stat Points are } (2, -27) \\ (-1, 0)$$

Q x y s t u.

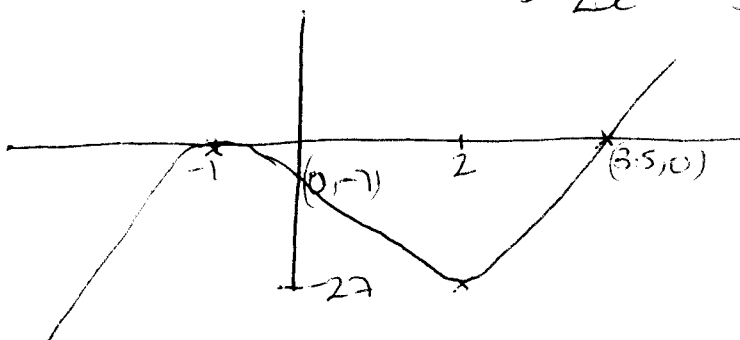
ii $\frac{d^2y}{dx^2} = 12x - 6$ $x=2$ $\frac{d^2y}{dx^2} = +ve$.

$x=1$ $\frac{d^2y}{dx^2} = -ve$.

Min pt at $(2, -27)$
Max pt at $(-1, 0)$.

iii $(x+1)^2 (2x-7) = (x^2+2x+1)(2x-7)$
 $= 2x^3 + 4x^2 + 2x - 7x^2 - 14x - 7$
 $= 2x^3 - 3x^2 - 12x - 7$.

iv



When $x=0$ $y=-7$.

When $y=0$ $x = -1$
or $7/2$.