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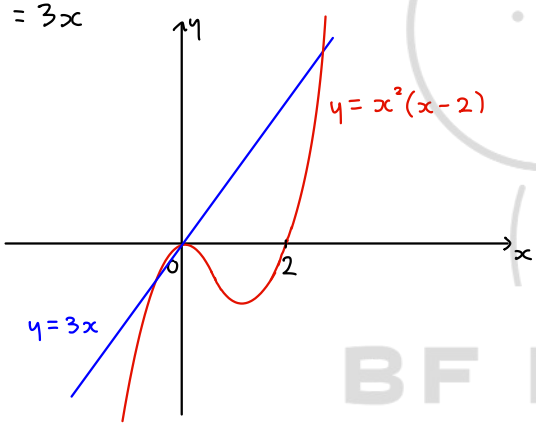
Problem Solving : Set B

Bronze

a) $y = x^2(x-2) \longrightarrow x = 0$ (double root), $x = 2$

$y = 3x$



b) 3 points of intersection

$\therefore$ 3 real solutions

c) $x^2(x-2) = 3x$

$x^2(x-2) - 3x = 0$

$x^3 - 2x^2 - 3x = 0$

$x(x^2 - 2x - 3) = 0$

$x(x+1)(x-3) = 0$

d) $x(x+1)(x-3) = 0$

$x(x^2 - 2x - 3) = 0$

$x^3 - 2x^2 - 3x = 0$

$x = 3$ or $x = 0$ or $x = -1$

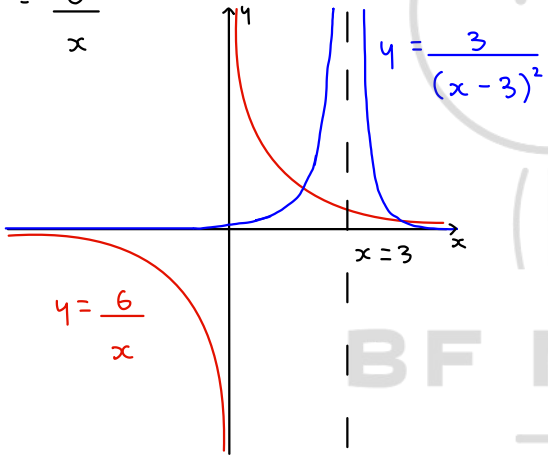
$y = 3(3)$ $\quad y = 3(0)$ $\quad y = 3(-1)$ $\quad \therefore$ points of intersection :

$y = 9$ $\quad y = 0$ $\quad y = -3$ $\quad (3, 9), (0, 0), (-1, -3)$

Silver

a) $y = \frac{3}{(x-3)^2} \longrightarrow \frac{3}{x^2}$ translate by vector $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$

$y = \frac{6}{x}$



b) 2 points of intersections
∴ 2 real solutions

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

$3x = 6(x-3)^2$
$3x = 6(x^2 - 6x + 9)$
$3x = 6x^2 - 36x + 54$
$0 = 6x^2 - 39x + 54$

$x = \frac{9}{2}$ or $x = 2$

$y = \frac{6}{9/2}$ $\quad y = \frac{6}{2}$

$y = \frac{4}{3}$ $\quad y = 3$

∴ Points of intersection: $(\frac{9}{2}, \frac{4}{3})$, $(2, 3)$

Gold

curve $C \rightarrow y = \frac{4}{(x-2)^2}$

line $L \rightarrow y = 5 - x$

a) $\frac{4}{(x-2)^2} = 5 - x$

$$4 = 5 - x(x-2)^2$$
$$4 = 5 - x(x^2 - 4x + 4)$$
$$0 = 5x^2 - 20x + 20 - x^3 + 4x^2 - 4x - 4$$
$$0 = -x^3 + 9x^2 - 24x + 16$$
$$0 = x^3 - 9x^2 + 24x - 16$$

Solve cubic equation:

$x = 4$ or $x = 1$

$y = 5 - 4$ $\quad$ $y = 5 - 1$

$y = 1$ $\quad$ $y = 4$

Points of intersection:

$(4, 1)$ and $(1, 4)$ already got

Gold

b) $y = 5 - x$

when $y = 0$, $0 = 5 - x$, $x = 5$ $(5, 0)$

when $x = 0$, $y = 5 - 0$, $y = 5$ $(0, 5)$

$y = \dfrac{4}{(x-2)^2} \longrightarrow \dfrac{4}{x^2}$ translate by vector $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$