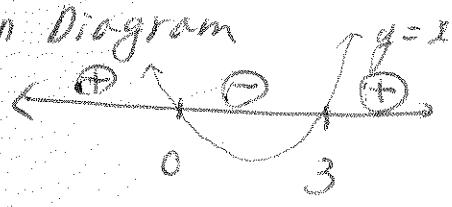
Pre HL Unit 1 (IB Exam Style Questions) Answer key

#1. $x(x-2) > x$

$x^2 - 2x - x > 0$

$x(x-3) > 0$

Sign Diagram



$(-\infty, 0) \cup (3, \infty)$

#2. Intersections of

$y = \left|\frac{3}{2}x - 3\right|$ & $y = 3$

$\Rightarrow \frac{3}{2}x - 3 = 3$

$\frac{3}{2}x = 6$

$x = 6 \cdot \frac{2}{3} = 4$

Another Intersecting point is $x = 0$.

$\Rightarrow$ Hence the vertex of the quadratic function is $(2, -3)$

$\Rightarrow y = a(x-2)^2 - 3$ is passing the coordinate of $(0, 3)$

$\Rightarrow 3 = a(4) - 3 \quad a = \frac{6}{4} = \frac{3}{2}$.

$\Rightarrow y = \frac{3}{2}(x-2)^2 - 3$

#3. $r_1 + r_2 = \frac{42}{5}$

$r_1 \cdot r_2 = \frac{2-a}{5}$.

$\frac{42}{5} + \frac{2-a}{5} = 0$

$\Rightarrow \frac{2-a}{5} = -\frac{42}{5}$

$\Rightarrow 2 - a = -42$

$a = 44$

#4 $4x^2 - 4x + 5$

$= 4(x^2 - x \quad] + 5$

$= 4(x^2 - x + (\frac{1}{2})^2] + 5 - 4(\frac{1}{4})$

$= \boxed{4(x - \frac{1}{2})^2 + 4}$

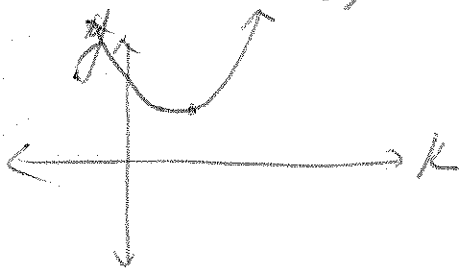
#5 Show $b^2 - 4ac$ is always greater than 2020.

$\Rightarrow (2k)^2 - (4)(3)(k-1)$

$\Rightarrow 4k^2 - 12k + 12$

$\Rightarrow 4(k^2 - 3k + (\frac{3}{2})^2) + 12 - (4)(\frac{9}{4})$

$\Rightarrow 4(k - \frac{3}{2})^2 + 3 = y$



Range of $y = 4(k - \frac{3}{2})^2 + 3$ is always greater than or equal to 3.

$\boxed{y \geq 3}$

$\therefore 3x^2 + 2kx + k + 1$

has two distinct real Roots for all real numbers.