IB Pre HL: Unit 1 F: Intersections of Functions **Notes: September 11** Key

Warm Up:

1) How many real zeros does $y = -3x^2 + 2x - 7$?

$\Delta = b^2 - 4ac = (2)^2 - (4)(-3)(-7) = 4 - 84 = -80 < 0$

No real zeros.

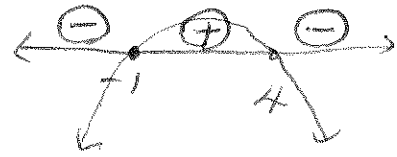
2) Solve the inequality: for x $-3x^2 + 9x + 12 \le 0$.

$-3(x^2 - 3x - 4) \le 0$

$-3(x-4)(x+1) \le 0$

$\Rightarrow (-\infty, -1) \cup (4, \infty)$

Sign diagram



Intersections of Functions

Example 1) Given: $f(x) = x^2 - x - 18$ and $g(x) = x - 3$

a) How many points of intersection do these functions have?

$x^2 - x - 18 = x - 3$

$x^2 - 2x - 15 = 0$

$\Delta = (2)^2 - (4)(1)(-15) > 0$

Two points of intersection

b) Find the points of intersection. $+3$, -5

$(x+3)(x-5) = 0$

$x = -3, \quad x = 5$

c) Find x for $f(x) > g(x)$.

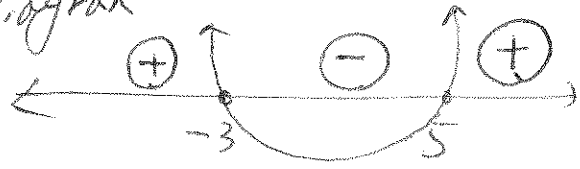
$x^2 - x - 18 > x - 3$

$x^2 - 2x - 15 > 0$

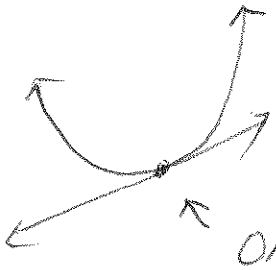
$(x+3)(x-5) > 0$

$(-\infty, 3) \cup (5, \infty)$

Sign diagram



Example 2) $y_1 = 2x + k$ is tangent to $y_2 = 2x^2 - 3x + 4$. Find k.



one solution.

$2x^2 - 3x + 4 = 2x + k$

$2x^2 - 5x + 4 - k = 0$

$\Delta = 0$

$(5)^2 - (4)(4-k)2 =$

$25 - 8(4-k) = 0$

$25 - 32 + 8k = 0$

$8k = 7$

$k = \frac{7}{8}$

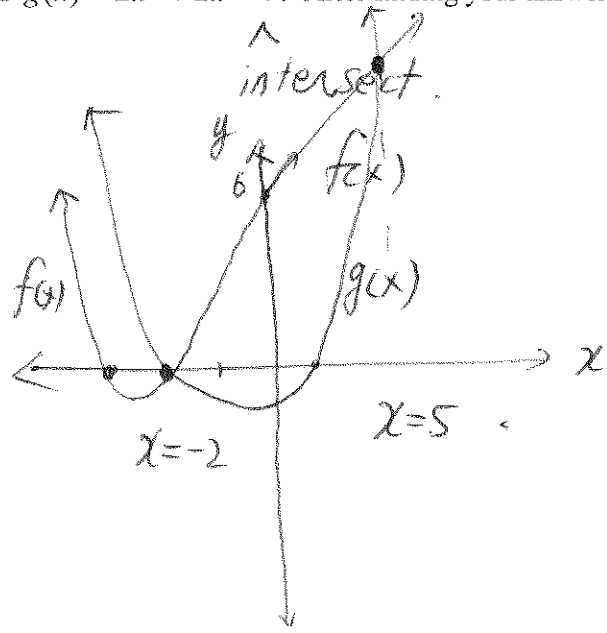
Example 3) Find the x values where $f(x) = x^2 + 5x + 6$ and $g(x) = 2x^2 + 2x - 4$. After finding your answer algebraically, support your answer graphically.

$x^2 + 5x + 6 = 2x^2 + 2x - 4$

$x^2 - 3x - 10 = 0$

$(x-5)(x+2) = 0$

$x = 5 \quad x = -2$



$f(x) = (x+3)(x+2)$

$g(x) = 2(x^2 + x - 2) = 2(x+2)(x-1)$

Practice) Find the x values where $f(x) = 2x^2 - x + 3$ > $g(x) = 2 + x + x^2$. After finding your answer algebraically, support your answer graphically.

$2x \quad 3 \quad 1$

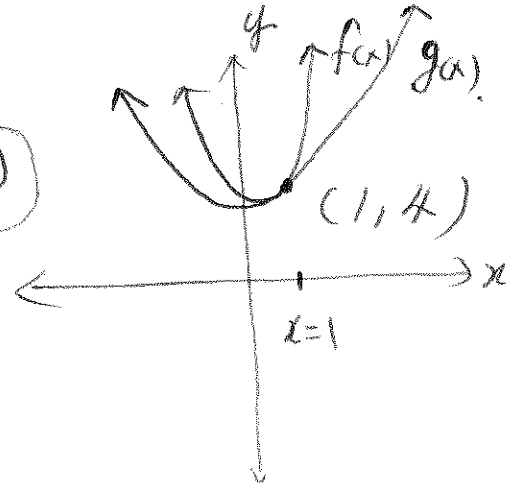
$2x^2 - x + 3 > 2 + x + x^2$

$x^2 - 2x + 1 > 0$

$(x-1)^2 > 0$

$(x-1)^2 = 0$ $\quad x = 1$

$(-\infty, 1) \cup (1, \infty)$



Sign diagram