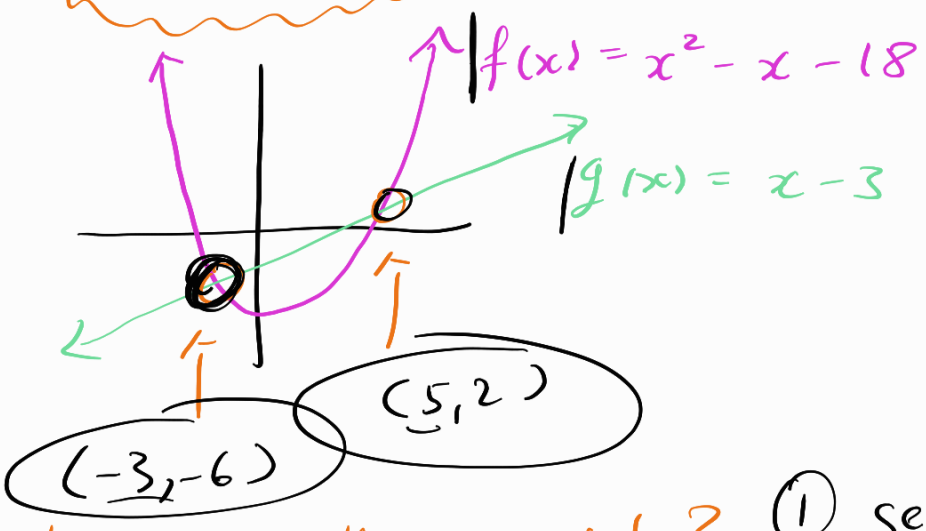
10/31/2023

Points of Intersection



④ get y-coords

$g(5) = 2$

$g(-3) = -6$

What are these points? ① set $f(x) = g(x)$

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

② move everything to 1 side

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

$-x+3 \qquad -x+3$

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

③ solve for x

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

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

Example: $f(x) = x^2 - 2x + 8$

$g(x) = 3x + 6$

Find pts of intersection

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

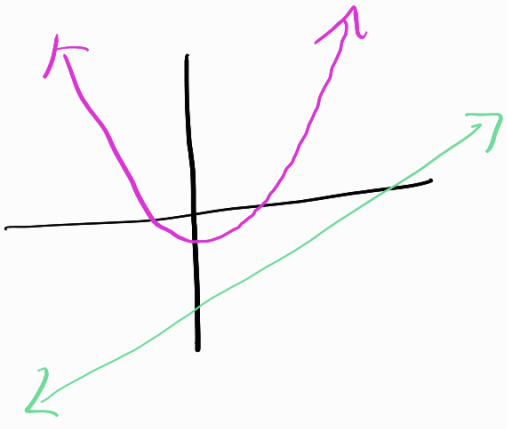
$g(x) = 2 + x + x^2$

Discriminant

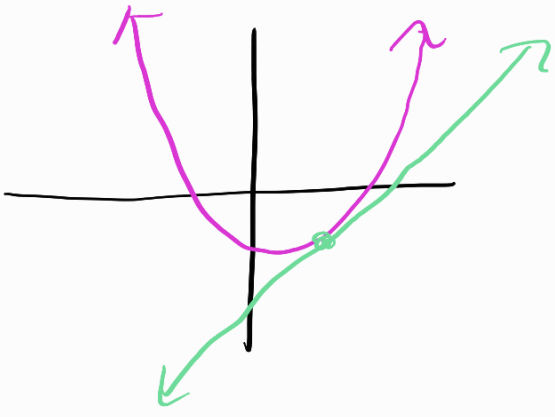
$\Delta = b^2 - 4ac$ >0 2 x-int

$=0$ 1 x-int

<0 no x-int.

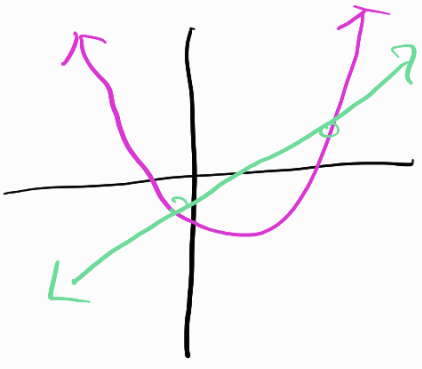


no intersection



Tangent lines

- touches the curve exactly once



Secant line

- crosses the curve twice

Example. $f(x) = 2x^2 - 3x + 4$

$g(x) = 2x +$ k ← some #

If $g(x)$ is tangent line to $f(x)$, what is k?

$f(x)$ & $g(x)$ touch exactly once

$\Rightarrow$ $f(x) = g(x)$ exactly once

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

$$-2x - k \qquad -2x - k$$

equal exactly once

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

quadratic!!!

$$b^2 - 4ac = 0$$

solve for k

$$25 - 4(2)(4 - k) = 0$$

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

$25 - 32 + 8k = 0$

$-7 + 8k = 0 \Rightarrow k = 7/8$

Find k such that the line $g(x) \rightarrow 3x + k$ is tangent to $f(x) = x^2 - 5x + 7$.