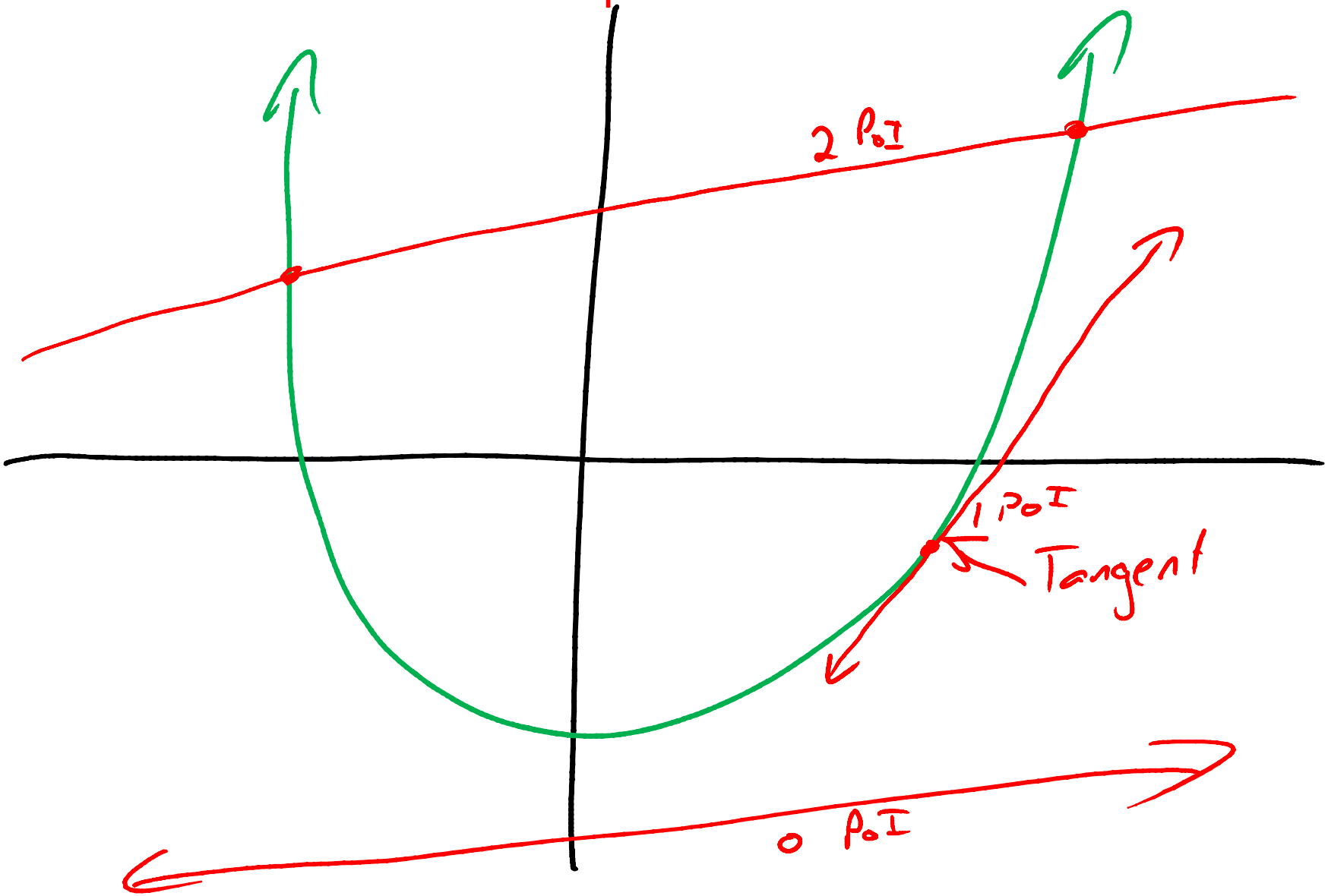
Mathematics 11U

3.8 – Linear Quadratic Systems

Mr. D. Hagen

How do lines interact with parabolas?



Example 1 $f(x) = -2x + 8$ $g(x) = 4x^2 + 12x - 7$

How many points of intersection?

$$f(x) = g(x)$$

$$-2x + 8 = 4x^2 + 12x - 7$$

$$0 = \underset{a}{4x^2} + \underset{b}{14x} \underset{c}{- 15}$$

$b^2 - 4ac \Rightarrow 14^2 - 4(4)(-15)$

$= 196 + 240$

$= 436 > 0 \quad \therefore$ two PoI.

Example 2 $f(x) = 3x + 5$ $g(x) = 2x^2 - 6x - 4$

Find the point(s) of intersection.

$f(x) = g(x)$

$3x + 5 = 2x^2 - 6x - 4$

$0 = 2x^2 - 9x - 9$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \dfrac{9 \pm \sqrt{9^2 - 4(2)(-9)}}{2(2)}$

$x = \dfrac{9 \pm \sqrt{153}}{4}$

$x = \dfrac{9 \pm 12.4}{4}$

$x = \dfrac{9 + 12.4}{4} = 5.35$

$x = \dfrac{9 - 12.4}{4} = -0.85$

POI's are:

$(5.35, \_\_\_\_)$

$(-0.85, \_\_\_\_)$

$$f(5.35) = 3(5.35) + 5$$

$$= 21.05$$

$$f(-0.85) = 3(-0.85) + 5$$

$$= 2.45$$

$\therefore$ POI's are $(5.35, 21.05)$ and $(-0.85, 2.45)$

Example 3 $f(x) = 2x + k \quad g(x) = 3x^2 + 5x - 2$

Find the value of *k* so that *f(x)* and *g(x)* intersect only once.

$b^2 - 4ac = 0$

$f(x) = g(x)$

$2x + k = 3x^2 + 5x - 2$

$0 = \overset{a}{3}x^2 + \overset{b}{3}x \overset{c}{-2-k}$

$b^2 - 4ac = 0$

$3^2 - 4(3)(-2-k) = 0$

$9 - 12(-2-k) = 0$

$9 + 24 + 12k = 0$

$33 + 12k = 0$

$\frac{12k}{12} = \frac{-33}{12}$

$k = \frac{-11}{4}$

$f(x) = 2x - \frac{11}{4}$