What's Going On?

Checking In	Your Thoughts...
Minds on	Think Pair Share
Action!	He's not heavy, he's my brother.
Consolidation	TIPS

Learning Goal - I will be able to create quadratic functions from given information.

Checking In

L.G.L.

You may want to do this on the sheet from yesterday

The percent of 15- to 19-year old males who smoke has been tracked by Health Canada. The data from 1981 to 1996 are given in the table below.

Year	1981	1983	1985	1986	1989	1991	1994	1995	1996
Smokers (%)	43.4	39.6	26.7	25.2	22.6	22.6	27.3	28.5	29.1

e. Based on the model, when is it expected that the percent of 15- to 19-year old males smoking will reach 50%?

$$S(t) = 0.29(t - 1990)^2 + 21$$

Set S(t) to 50, and "solve" for t!

$$0.29(t - 1990)^2 + 21 = 50$$

$$-21 \quad -21$$

$$\frac{0.29(t-1990)^2}{0.29} = \frac{29}{0.29}$$

$$\sqrt{(t-1990)^2} = \sqrt{100}$$

$$t - 1990 = \pm 10$$

$t - 1990 = 10$ AND $t - 1990 = -10$

$t = 2000$ & $t = 1980$

Checking In

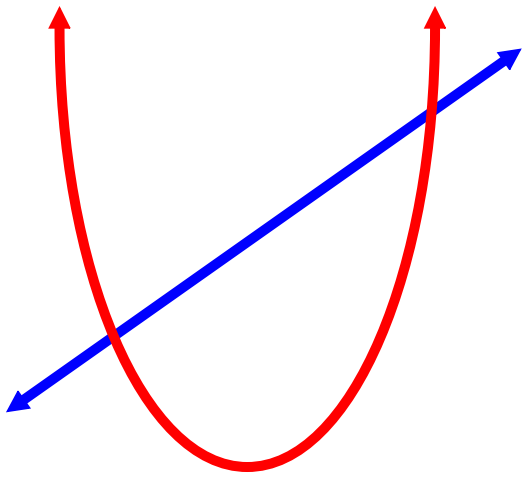
Unit Test

The Day After Tomorrow

Minds on

Think, Pair, Share

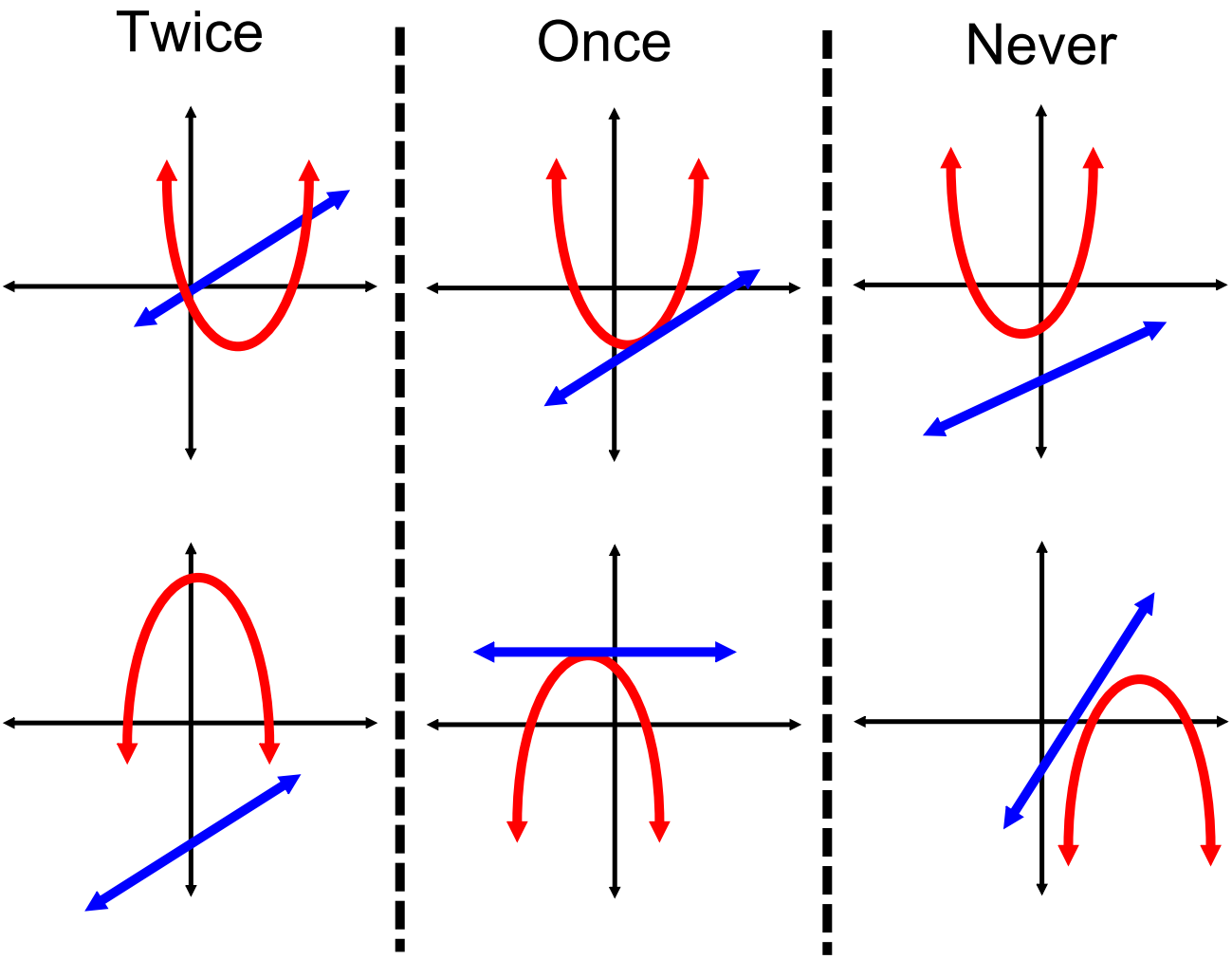
In how many ways can a **line** intersect a **parabola**?



Minds on

Think, Pair, Share

How many times can a line intersect a parabola?



Minds on

Linear-Quadratic Systems

A line can intersect a parabola in 3 different ways:

1. Two points of intersection.
2. One point of intersection.
   (the line is said to run **"tangent"** to the parabola)
3. No points of intersection.

Minds on

Think, Pair, Share

How can we determine whether a line and a parabola meet once, twice or never **without** actually solving (or graphing)?

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

$y = 3x - 1$

$2x^2 - 5x + 6 = 3x - 1$

$-3x \quad -3x$

$2x^2 - 8x + 6 = -1$

$+1 \quad +1$

$$2x^2 - 8x + 7 = 0$$

Look at the discriminant!

$b^2 - 4ac = (-8)^2 - 4(2)(7)$

$= 64 - 56$

$= 8$

$$2x^2 - 8x + 7 = 0$$

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

$$= \frac{-(-8) \pm \sqrt{(-8)^2 - 4(2)(7)}}{2(2)}$$

$$= \frac{8 \pm \sqrt{8}}{4}$$

$$= \frac{8 \pm 2\sqrt{2}}{4}$$

$$= \frac{4 \pm \sqrt{2}}{2}$$

$\frac{4+\sqrt{2}}{2} \rightarrow \doteq 2.71$ and

$\frac{4-\sqrt{2}}{2} \rightarrow \doteq 1.29$

axis of symmetry $= \frac{2.71 + 1.29}{2} = 2$

To find the y-values of the points of intersection, take the x-values that we found using the quadratic formula and plug them in to the equation.

$$2x^2 - 6x + 7 = 0$$

$$x = 2.71 \text{ and } 1.29$$

$$y = 2x^2 - 6x + 7$$

$$y = 2(2.71)^2 - 6(2.71) + 7$$

$$y = 14.69 - 21.68 + 7$$

$$= 0$$

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

$y = 3x - 1$

$x = 2.71$ and 1.29

When $x = 2.71$

$y = 3(2.71) - 1$

$y = 7.13$

When $x = 1.29$

$y = 3(1.29) - 1$

$y = 2.87$

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

$y = 3x - 1$

$x = 2.71$ and 1.29

When $x = 2.71$

$y = 2(2.71)^2 - 5(2.71) + 6$

$= 7.138$

Action!

Return to Profit Models

Example

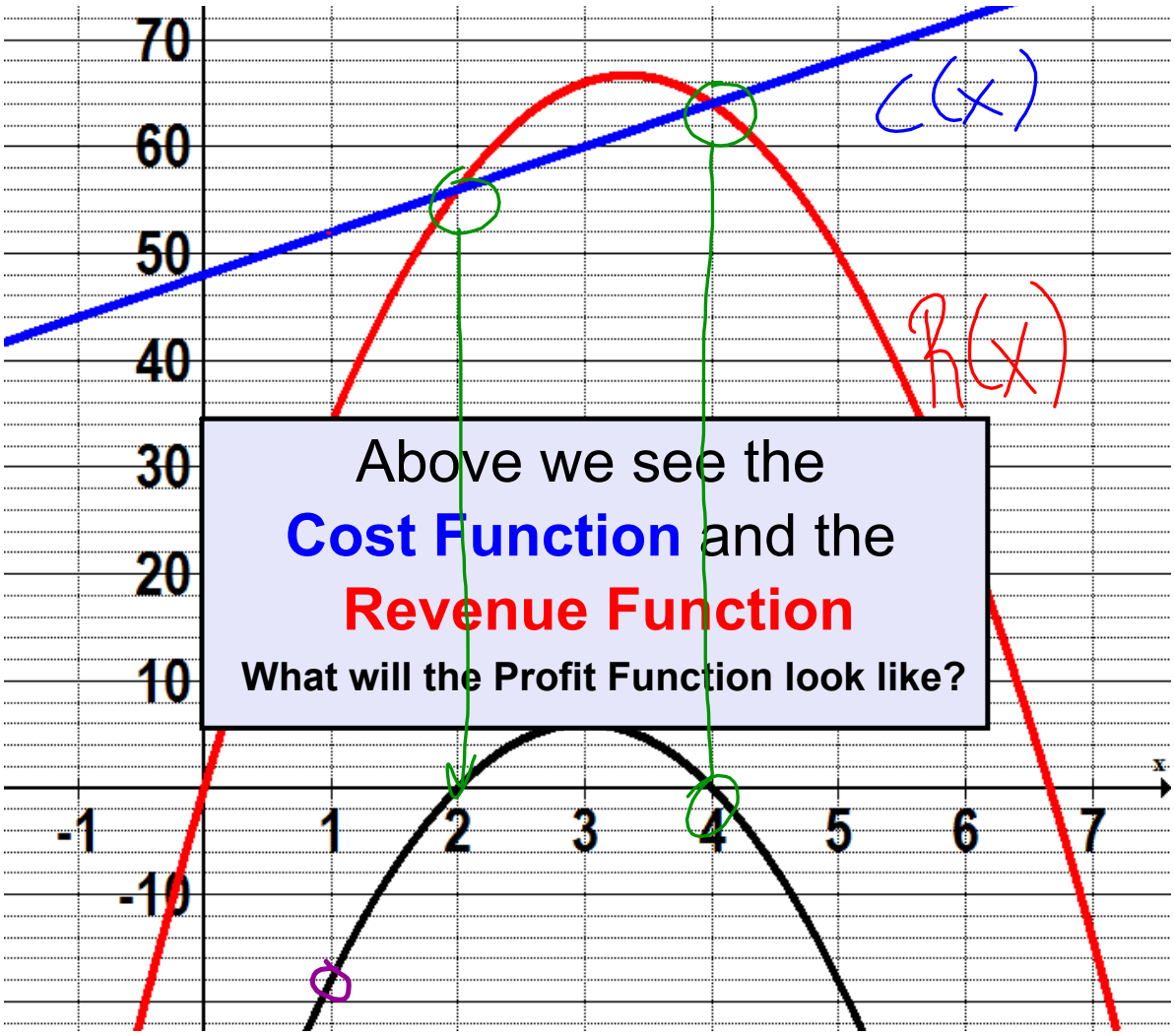
The demand function for a new magazine is $p(x) = -6x + 40$, where $p(x)$ represents the selling price, in thousands of dollars, of the magazine and x is the number sold, in thousands. The cost function is $C(x) = 4x + 48$. Calculate the maximum profit and the number of magazines sold that will produce the maximum profit. $R(x) = C(x)$

Revenue Function

$R(x) = -6x^2 + 40x$

Profit Function

$P(x) = R(x) - C(x)$


70
60
50
40
30
20
10
-1
-10
1
2
3
4
5
6
7
x
C(x)
R(x)
Above we see the
Cost Function and the
Revenue Function
What will the Profit Function look like?

Action!

Skeet shooting

The height *h(t)* of a baseball, in meters, at time t seconds after it is tossed out of a window is modelled by the function $h(t) = -5t^2 + 20t + 15$. A boy shoots at the baseball with a paintball gun. The trajectory of the paintball is given by the function $g(t) = 3t + 3$.

a. When will the paintball hit the baseball?
b. What will be the height of the baseball at the time of collision?
c. Determine the domain and range of $g(t)$ and $h(t)$.

They meet when the height of the ball is THE SAME as the height of the paintball.

a) ORRRRRR when **h(t) = g(t)**

$-5t^2 + 20t + 15 = 3t + 3$

$-3t \quad -3t$

$-5t^2 + 17t + 15 = 3$

$-3 \quad -3$

$-5t^2 + 17t + 12 = 0$

$-5t^2 + 20t - 3t + 12 = 0$

$-5t(t-4) - 3(t-4) = 0$

$(t-4)(-5t-3) = 0$

$\therefore t = 4s$ or $t = \frac{-3}{5}$ impossible

$= -0.6s$

$\therefore$ they meet after 4 seconds!!

Action!

Skeet shooting

The height *h(t)* of a baseball, in meters, at time t seconds after it is tossed out of a window is modelled by the function $h(t) = -5t^2 + 20t + 15$. A boy shoots at the baseball with a paintball gun. The trajectory of the paintball is given by the function $g(t) = 3t + 3$.

a. When will the paintball hit the baseball?
b. What will be the height of the baseball at the time of collision?
c. Determine the domain and range of $g(t)$ and $h(t)$.

b) When $t = 4$

$$h(4) = -5(4)^2 + 20(4) + 15$$
$$= -5(16) + 80 + 15$$
$$= -80 + 80 + 15$$
$$= 15$$

$$g(4) = 3(4) + 3$$
$$= 12 + 3$$
$$= 15$$

∴ the height is 15m!

Action!

Our Good Friend k

Determine the value(s) of k that such that **$g(x) = 6x + k$** intersects **$f(x) = 4x^2 - 2x - 5$** at only one point.

Action!

Our Good Friend k

Determine the value(s) of k that such that
g(x) = -2x + k does not intersect **f(x) = -3x² + 4x + 1.**

Consolidation

Clear / Unclear

Determining features from a graph

Determining features from an equation

Completing the Square

Solving by Factoring

Solving by the Quadratic Formula

Determining the Inverse of a Quadratic

Profit Functions

Radicals

Determining an Equation from Given Information

Linear-Quadratic Systems