Welcome MYP 9 Mathematics!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 3/19 - Quiz Friday, no homework Topic:	0 1 2	
Tuesday Date: 3/20 Topic: 18BC: Solving Quadratics	0 1 2	
Wednesday Date: _____ Topic:	0 1 2	
Thursday Date: _____ Topic:	0 1 2	
Friday Date: _____ Topic:	0 1 2	

Warm-up:

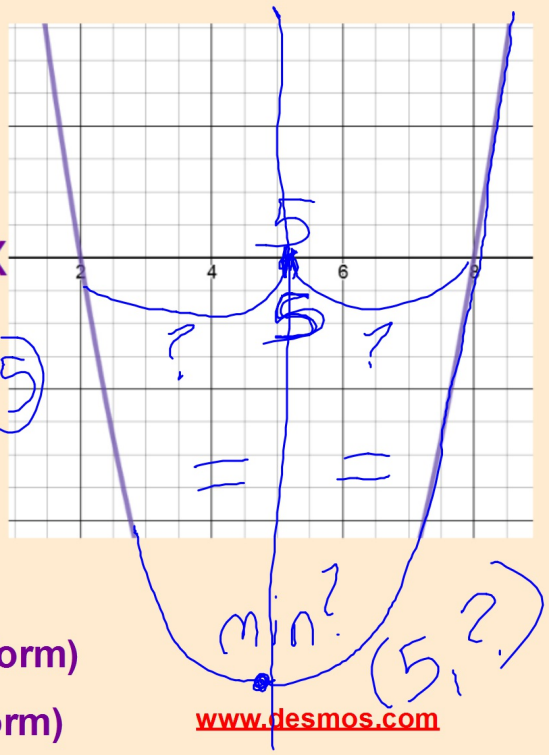
1) Identify the x-intercepts.

(2, 0) (8, 0)

2) Use the x-intercepts to find the x-coordinate of the vertex.

$\frac{2+8}{2} = \frac{10}{2} = 5$

3) How can we find the y-coordinate of the vertex?



$y = (x-2)(x-8)$ **(Factored form)**

$y = x^2 - 10x + 16$ **(General form)**

www.desmos.com

Warm-up continued:

3) How can we find the y-coordinate of the vertex?

Vertex: (5, y)

(Factored form) $y = (x-2)(x-8)$

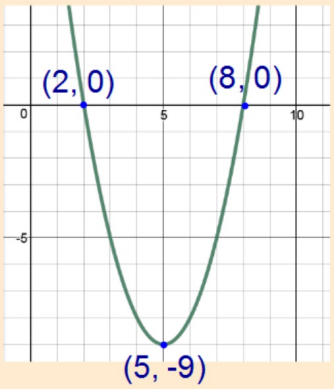
(General form) $y = x^2 - 10x + 16$

$y = (x-2)(x-8)$

$y = (5-2)(5-8)$

$y = 3(-3)$

$y = -9$



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Class Plan

1. Warm-up
2. Model a dive into a pool!

3. Practice: Verify critical points, and defend realism, (*or not realistic)*.

4) Choose partners for quiz

Top 3 Olympic 10M Platform Diving Scores Ever
[10 meters is *about* 30 feet]

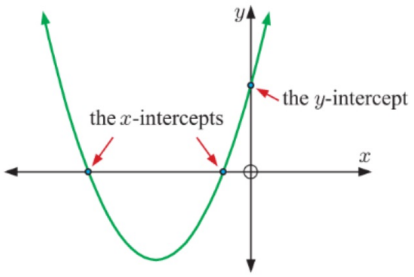
https://www.youtube.com/watch?v=sb82tVOq2dY

Recall: From yesterday

C **AXES INTERCEPTS**

Suppose we are given a function and its graph.

- An ***x*-intercept** is a value of x where the graph meets the x-axis.
  x-intercepts are found by letting y be 0 in the equation of the function.
- A ***y*-intercept** is a value of y where the graph meets the y-axis.
  y-intercepts are found by letting x be 0 in the equation of the function.



$$y = ax^2 + bx + c$$

General form:

y-intercept = **c**

$$y = a(x - r_1)(x - r_2)$$

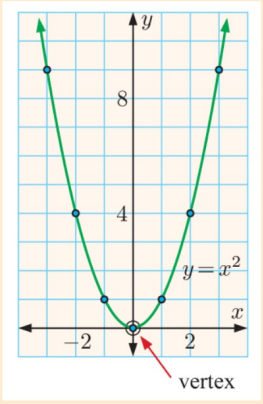
Factored form:

x-intercepts = $\mathbf{r_1}$ & $\mathbf{r_2}$

A QUADRATIC FUNCTIONS

Notice that:

- The curve is a **parabola** and it opens upwards.
- There are no negative y values, since $x^2 \geqslant 0$ for all x. The curve does not go below the x-axis.
- The curve is **symmetrical** about the y-axis.
  For example: when $x = -3$, $y = (-3)^2 = 9$
  when $x = 3$, $y = 3^2 = 9$.
- The curve has a **turning point** or **vertex** at $(0, 0)$.



x-coordinate of vertex (average of the roots/ x-intercepts)

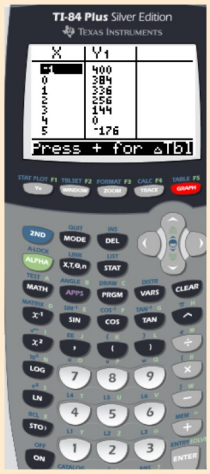
$$y = a(x - r_1)(x - r_2)$$

$$\frac{r_1 + r_2}{2}$$

Model a dive into a pool!

Do: 1) Read the task. (2 min)
2) Find critical points (intercepts and vertex)
3) Answer questions.
4) Graph critical points.

Done? Help others, and begin analysis.



Part a) Find height of the diving platform.

A diver is standing on a platform above the pool. She jumps from the platform with an initial upward velocity of 4ft/sec. The equation below models the path of her jump and decent to the water. (t represents time in seconds, and h represents the height in inches).

$$y = -16x^2 - 32x + 384$$

Finding Critical Points

time is zero before she dives.

a) At what height was the swimmer diving from? Solve for this height using the equation.

$y = -16(0)^2 - 32(0) + 384$

$y = ??$

What is this point called on the graph?_____

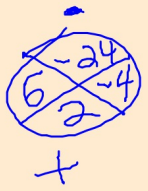
Part b) Find the time when the diver hits the water.

b) How long will it take for the diver to hit the pool?

Solve for this time using the equation and factored form.

0 feet hit the water

$$\frac{0}{-16} = \frac{-16t^2}{-16} - \frac{32t}{-16} + \frac{384}{-16}$$



$$0 = t^2 + 2t - 24 = (t+6)(t-4)$$

(x-intercept)

How is this shown on the graph? $t = -6$ sec

(time, height) = (4, 0) $t = 4$ sec

<u>Part c)</u> Find the time when the diver is at their heighest distance in the air.

c) How long will it take the diver to hit her maximum height?

Use the x-intercepts to show this time.

$$\frac{r_1 + r_2}{2}$$

$$\frac{4 - 6}{2} = \frac{-2}{2} = -1$$

$$y = -16(-1)^2 - 32(-1) + 384$$

$$y = -16 + 32 + 384$$

$$y = 400 \text{ in} \approx 33.3 \text{ ft}$$

Part d) Find the maximum height of the diver.

d) What is the maximum height of the diver?

Use the equation to show this height.

$$y = -16x^2 - 32x + 384$$

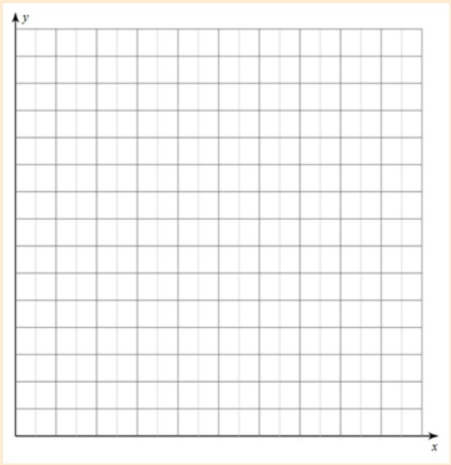
What do we call this point on the graph?_____

Graphing Critical Points

$$y = -16x^2 - 32x + 384$$

Enter the equation in your graphing calculator. Then record the table to draw the path of the diver in the graph below.

Time (seconds)	4	-6	0	-1			
Height (feet)	0	0	32	33.3			



Graphing Critical Points

Examine your practice from today against Ms. Paulson's key!

1) What parts did you miss?
2) How much detail did you provide?
3) How did you verify your solutions?
4) What score would you give yourself?

7 8	The student is able to: i. **identify** the relevant elements of the authentic real-life situation ii. **select** appropriate mathematical strategies to model the authentic real-life situation iii. **apply** the selected mathematical strategies to reach a correct solution to the authentic real-life situation iv. **Verify** the degree of accuracy of the solution v. **justify** whether the solution makes sense in the context of the authentic real-life situation	• Necessary critical points are found. [X-intercept, y-intercept, vertex] (Found algebraically with ***appropriate*** work shown). • Solutions are interpreted and ***justified*** using the real-life context. • **Discuss** how aspects of the model could affect accuracy.

Solutions to the modeling of Platform Diving

Finding Critical Points

a) At what height was the swimmer diving from? How can you show this height using the equation? What is this point called on the graph? Y-intercept

$t = 0, h = ?$

$h = -16(0)^2 - 32(0) + 384$

$h = 0 - 0 + 384$

$h = 384$ inches

(384 inches = 32 ft)

b) How long will it take for the diver to hit the pool? How can this be found using the equation and factored form? How is this shown on the graph? X-intercepts

$h = 0$ (diver hits the water)

$t = ?$

$$\frac{0}{-16} = \frac{-16t^2}{-16} - \frac{32t}{-16} + \frac{384}{-16}$$

$0 = t^2 + 2t - 24$

$0 = (t + 6)(t - 4)$ ← Factored form

$t + 6 = 0$

$-6 \quad -6$

$t = -6$ sec

$t - 4 = 0$

$+4 \quad +4$

$t = 4$ seconds

Solutions to the modeling of Platform Diving

c) How long will it take the diver to hit her maximum height? What line goes through this point on the graph? ~~How can we use the equation to show this time~~?

Maximum will occurr between 4 and -6 seconds.

$\frac{-6+4}{2} = \frac{-2}{2} = -1$ second

At -1 second, the diver will be at their maximum height. {Line of symmetry goes through MAX.}

d) What is the maximum height of the diver? What do we call this point when the maximum height and the time from d) are put in an ordered pair? How can we use the equation to show this height?

Max height after -1 second in the air.

h = ?

$h = -16(-1)^2 - 32(-1) + 384$

$h = -16 + 32 + 384$

$h = 400$ inches

Vertex: (-1 second, 400 in)

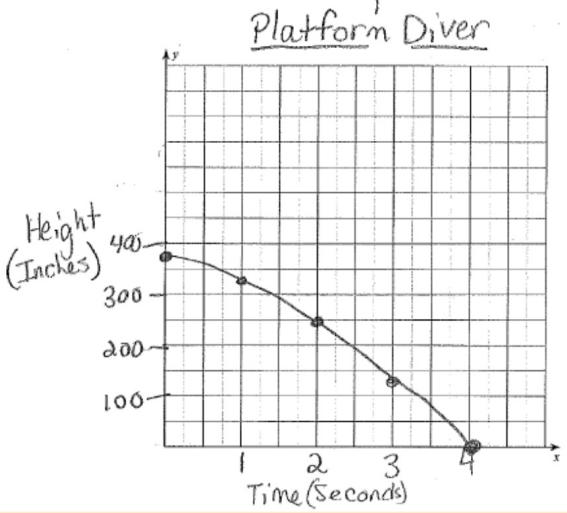
Solutions to the modeling of Platform Diving

Graphing Critical Points $h = -16t^2 - 32t + 384$

Enter the equation in your graphing calculator. Then record the table to draw the path of the diver in the graph below.

(From Calculator)

Time (seconds)	-1	0	4	1	2	3	
Height (feet)	400	384	0	336	256	144	



Exercises: Analyze your work from today.

Analyzing Critical Points Record and respond on a separate sheet of paper:

From the MYP RUBRIC:
"**Justify** whether the solution makes sense in the context of the authentic real-life situation"

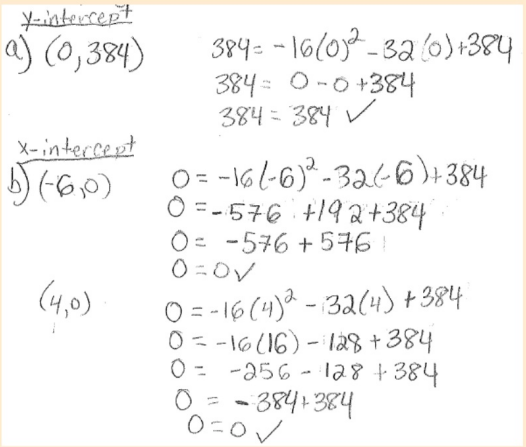
1) Which critical point(s) seem realistic? Why or why not?

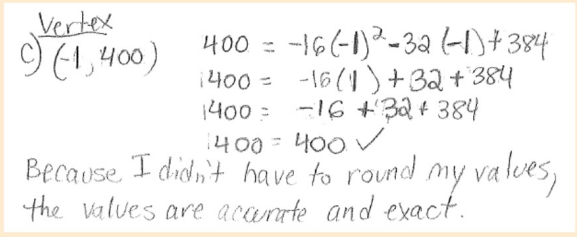
From the MYP RUBRIC:
"**Verify** the degree of accuracy of the solution"

2) How can you verify the accuracy of your answers? How can you use the equation or graph to defend the accuracy of your work?

Analysis of the modeling of Platform Diving

From the MYP RUBRIC:
"Verify the degree of accuracy of the solution"

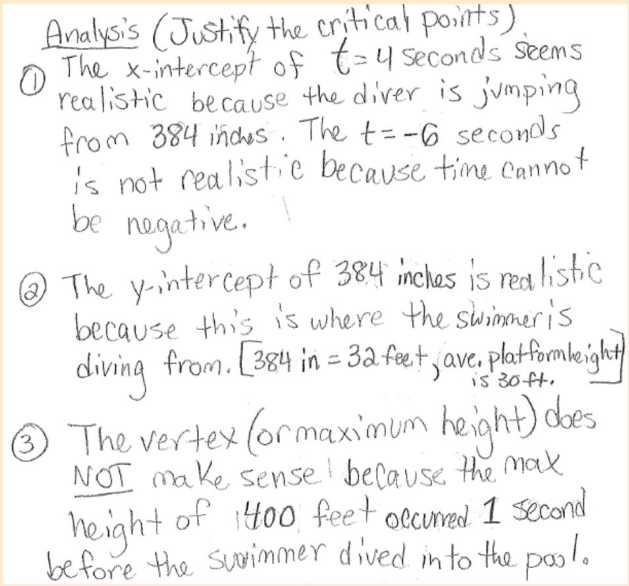




Analysis of the modeling of Platform Diving

From the MYP RUBRIC:

"**justify** whether the solution makes sense in the context of the authentic real-life situation"



Analysis (Justify the critical points)

① The x-intercept of $t = 4$ seconds seems realistic because the diver is jumping from 384 inches. The $t = -6$ seconds is not realistic because time cannot be negative.

② The y-intercept of 384 inches is realistic because this is where the swimmer is diving from. [384 in = 32 feet, ave. platform height is 30 ft.]

③ The vertex (or maximum height) does NOT make sense because the max height of 1400 feet occurred 1 second before the swimmer dived into the pool.