

8.5 Functioning With Parabolas



A Solidify Understanding Task

Sketch the graph of each parabola (accurately), find the vertex and use the geometric definition of a parabola to find the equation of these parabolas. **start on lesson 8.5**

1. Directrix $y = -4$, Focus $A(2, -2)$

Vertex $(2, -3)$

Equation: $y = \frac{1}{4}(x-2)^2 - 3$

what growth factor?

1	1	~
2	4	~
3	9	~
		1

2. Directrix $y = 2$, Focus $A(-1, 0)$

Vertex $(-1, 1)$

Equation: $y = -\frac{1}{4}(x+1)^2 + 1$

$p = 1$

3. Directrix $y = 3$, Focus $A(1, 7)$

Vertex $(1, 5)$

Equation: $y = \frac{1}{8}(x-1)^2 + 5$

1	1	~
2	4	~
3	9	~
4	16	2 = 2/16 = 1/8

4. Directrix $y = 3$, Focus $A(2, -1)$

Vertex $(2, 1)$

Equation: $y = -\frac{1}{8}(x-2)^2 + 1$

$y = \frac{1}{4p}(x-h)^2 + k$

$4p(y-k) = (x-h)^2$

READY, SET, GO!	Name _____	Period _____	Date _____
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READY

Topic: Standard form of a quadratic.

Verify that the given point lies on the graph of the parabola described by the equation. (Show your work.)

1. $(6,0)$ $y = 2x^2 - 9x - 18$
2. $(-2,49)$ $y = 25x^2 + 30x + 9$
3. $(5,53)$ $y = 3x^2 - 4x - 2$
4. $(8,2)$ $y = \frac{1}{4}x^2 - x - 6$

SET

Topic: Equation of parabola based on the geometric definition

5. Verify that $(y-1) = \frac{1}{4}x^2$ is the equation of the parabola in Figure 1 by plugging in the 3 points V (0,1), C (4,5) and E (2,2). Show your work for each point!

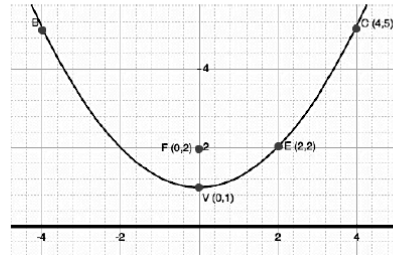
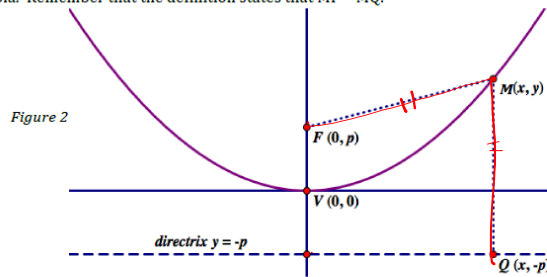


Figure 1

6. If you didn't know that (0,1) was the vertex of the parabola, could you have found it by just looking at the equation? Explain.

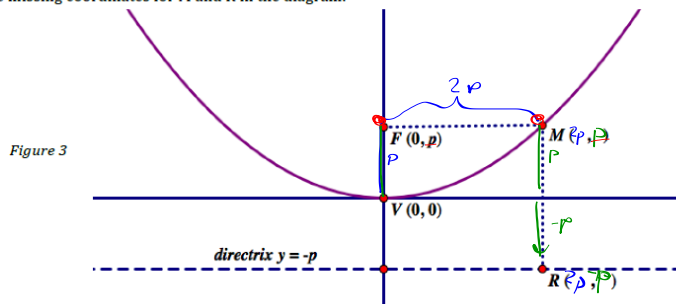
7. Use the diagram in Figure 2 to derive the general equation of a parabola based on the geometric definition of a parabola. Remember that the definition states that $MF = MQ$.

video notes



8. Recall the equation in #5, $(y-1) = \frac{1}{4}x^2$, what is the value of p ? *$\frac{1}{4} = \frac{1}{4p}$*
9. In general, what is the value of p for any parabola? *$p = 1$*
 $\frac{1}{2}$ the distance between the focus & directrix

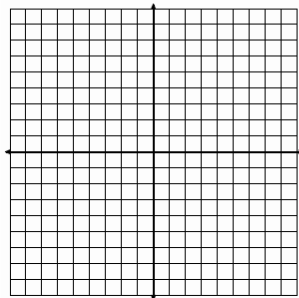
10. In Figure 3, the point M is the same height as the focus and $\overline{FM} \cong \overline{MR}$. How do the coordinates of this point compare with the coordinates of the focus? *both up p , y-coordinate is p .* Fill in the missing coordinates for M and R in the diagram.



Sketch the graph by finding the vertex and the point M and R (the reflection of M) as defined in the diagram above. Use the geometric definition of a parabola to find the equation of these parabolas.

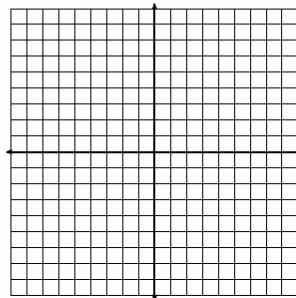
11. Directrix $y = 9$, Focus $F(-3, 7)$

Vertex _____
Equation _____



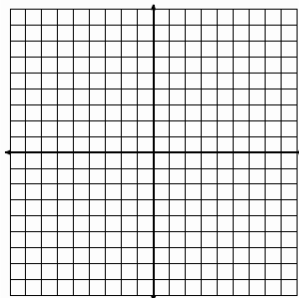
12. Directrix $y = -6$, Focus $F(2, -2)$

Vertex _____
Equation _____



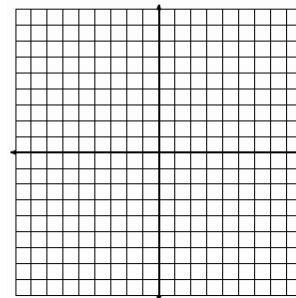
13. Directrix $y = 5$, Focus $F(-4, -1)$

Vertex _____
Equation _____



14. Directrix $y = -1$, Focus $F(4, -3)$

Vertex _____
Equation _____



$x = \frac{-b}{2a}$

GO

Topic: Finding maximum and minimum values for quadratics

find vertex $-x^2$ \rightarrow max \rightarrow min $+x^2$

Find the maximum or minimum value of the quadratic. Indicate which it is.

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

$(x^2 + 6x + 9) - 5 - 9$

$= 9$

$y = (x + 3)^2 - 14$

vertex $(-3, -14)$ min

16. $y = 3x^2 - 12x + 8$

$3(x^2 - 4x + 4) + 8 - 12$

$y = 3(x - 2)^2 - 4$

vertex $(2, -4)$ min

17. $y = \frac{1}{2}x^2 + 10x + 13$

$-\frac{1}{2}(x^2 - 20x + 100) + 13 + 50$

$(-10, 100)$

$y = -\frac{1}{2}(x - 10)^2 + 63$

vertex $(10, 63)$

$x = \frac{-b}{2a} = \frac{-10}{2(\frac{1}{2})} = 10$, $y = -\frac{1}{2}(10)^2 + 10(10) + 13 = -50 + 100 + 13 = 63$

18. $y = -5x^2 + 20x - 11$

19. $y = \frac{7}{2}x^2 - 21x - 3$

20. $y = -\frac{3}{2}x^2 + 9x + 25$