Section 3.1 Quadratic Functions

↳ Parabola

Two Forms:

General:

$f(x) = ax^2 + bx + c$

If $a > 0$, opens up - vertex is a minimum

If $a < 0$, opens down - vertex is a maximum.

$D = (-\infty, \infty)$

$R = [u, \infty)$ if $a > 0$ and

$(-\infty, u]$ if $a < 0$

u is the y-coordinate of the vertex.

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

$y = f\left(-\frac{b}{2a}\right)$

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x-ints: Solve $ax^2 + bx + c = 0$

y-int: $(0, c)$

Axis of symmetry: $x = -\frac{b}{2a}$

Vertex:

$f(x) = a(x-h)^2 + k$

If $a > 0$, opens up

If $a < 0$, opens down

$D = (-\infty, \infty)$

$R = [k, \infty)$ if $a > 0$

$(-\infty, k]$ if $a < 0$

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vertex: (h, k)

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x-ints: Solve $a(x-h)^2 + k = 0$

y-int: Plug 0 in for x

Axis of symmetry: $x = h$

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ex. Find the vertex and axis of symmetry for

$f(x) = 2x^2 + 8x - 7$

$a = 2 \quad b = 8 \quad c = -7$

$$x = -\frac{8}{2 \cdot 2} = -\frac{8}{4} = -2$$

$$f(-2) = 2(-2)^2 + 8(-2) - 7$$
$$= 2 \cdot 4 - 16 - 7$$
$$= -15$$

vertex $= (-2, -15)$

axis of symmetry $x = -2$

ex: Find
1. vertex
2. Axis of symmetry
3. intercepts
4. Domain
5. Range
6. Sketch

$f(x) = -x^2 - 10x - 9$

1 vertex:

$$x = \frac{-(-10)}{2(-1)} = -5$$

$$f(-5) = -(-5)^2 - 10(-5) - 9$$
$$= -25 + 50 - 9$$
$$= 16$$

$(-5, 16)$

2 Axis: $x = -5$

3 intercepts:

$(-1)(-x^2 - 10x - 9 = 0)$

$$x^2 + 10x + 9 = 0$$

$\frac{x}{1}$ 1 9 $\frac{x}{9}$

9

10

$$(x+1)(x+9) = 0$$

$x + 1 = 0 \quad x + 9 = 0$

$x = -1 \quad x = -9$

$(-1, 0) \quad (-9, 0)$

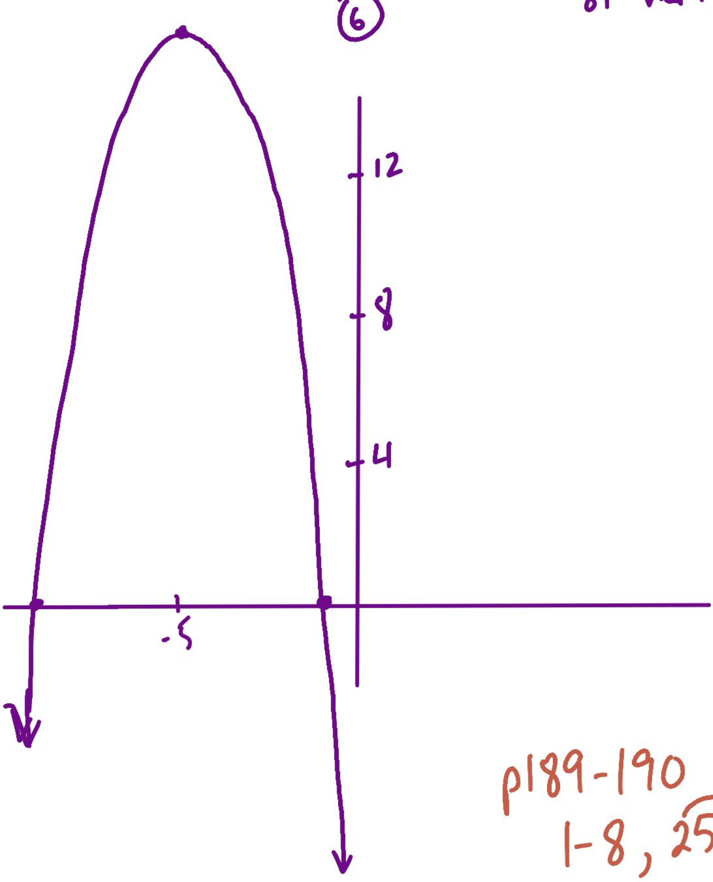
y-int: $(0, -9)$

4 $D = (-\infty, \infty)$

5 $R = (-\infty, 16]$

y-coord of vertex

6



p189-190 follow 6 steps from notes

1-8, $\underbrace{25, 26, 31, 32, 40}$