3.1 Notes: Quadratic Functions

$$f(x) = ax^2 + bx + c \quad \text{(general form)}$$

↑ y-intercept
located at (0, c)

$$f(x) = a(x - h)^2 + k \quad \text{(standard form)}$$

Vertex = (h, k)

Note: use opposite value of what is inside parentheses

If a > 0, then vertex is a <u>minimum</u> point.

If a < 0, then vertex is a <u>maximum</u> point.

Reminders:

To solve for x-intercepts, let y = 0

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To "complete the square":

factor "a" using parentheses, then

divide "x" coefficient by 2 and square it

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$$f(x) = 2x^2 - 16x + 1$$

$$= 2(x^2 - 8x + \_\_\_\_) - \_\_\_\_ + 1$$

$$= 2(x^2 - 8x + 16) - 32 + 1$$

$$= 2(x - 4)^2 - 31$$

h k

2 is positive so parabola opens upward and has a minimum value

Vertex = (4, 31)

Today's assignment: ONLY sketch graphs for #15,17,19,22; NO DECIMALS→use fractions for #23,29,33

22. $f(x) = 2x^2 + 12x + 10$ → answer parts a-d

y-int

a) $y = 2(x^2 + 6x + 9) - 18 + 10$

$\frac{6}{2} = 3$

$(3)^2 = 9$

$y = 2(x+3)^2 - 8$

b.) vertex: $(-3, -8)$

y-int: $(0, 10)$

$(-1, 0)$
$(-5, 0)$

x-int let $y=0$

$0 = 2(x+3)^2 - 8$

$\frac{8}{2} = \frac{2(x+3)^2}{2}$

$\pm\sqrt{4} = \pm\sqrt{(x+3)^2}$

$\pm 2 = x + 3$

$-3 \pm 2 = x$

$x = -1$

$x = -5$

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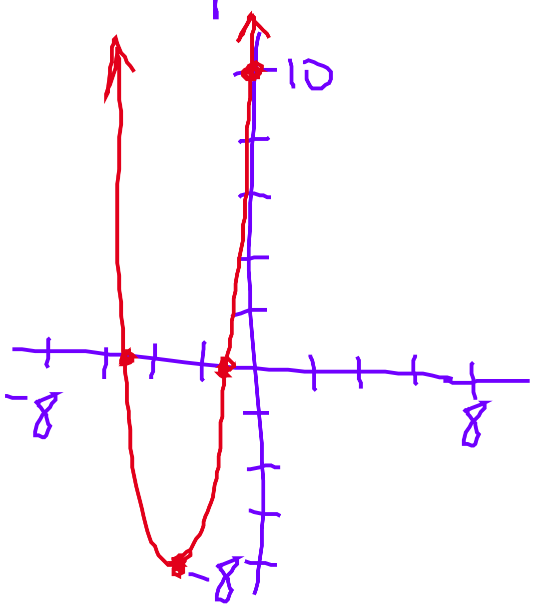
$$22.\ f(x) = 2x^2 + 12x + 10 \quad \rightarrow \text{answer parts a-d}$$

c.) Sketch using info from part b.



d.) Domain:
$x = \mathbb{R}$
or $(-\infty, \infty)$

Range: $y \geq -8$
or $[-8, \infty)$

Today's assignment: ONLY sketch graphs for #15,17,19,22;
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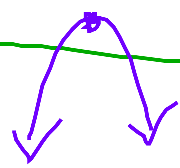
33. $h(x) = 1 - x - x^2$ → only answer parts a and c

a) $y = (-x^2 - x) + 1$

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

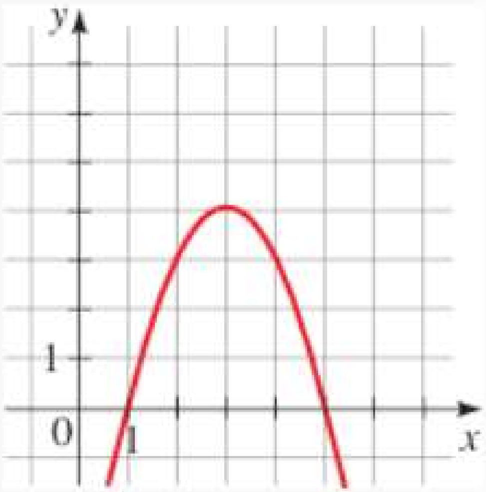
$\left(\frac{1}{2}\right)^2 = \frac{1}{4}$

$y = -1\left(x + \frac{1}{2}\right)^2 + \frac{5}{4}$ (h, k)



c) maximum at $\left(-\frac{1}{2}, \frac{5}{4}\right)$

5. $f(x) = -x^2 + 6x - 5$



5. Hint: Use the graph to find all but the y-intercept.

Use the graph to identify:

a) vertex

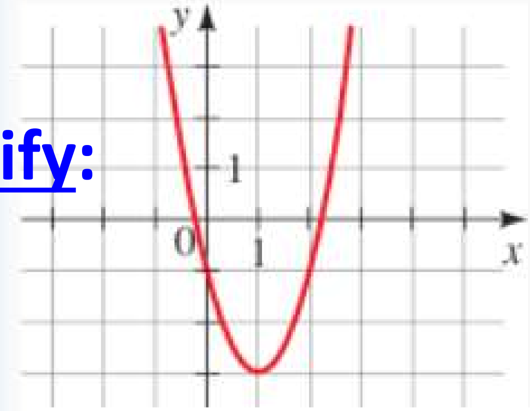
x-int, y-int

b) Minimum

or maximum

c) Domain & Range

7. $f(x) = 2x^2 - 4x - 1$



7. Hint:

Use quadratic formula to find the x-intercepts in this case.

$$0 = 2x^2 - 4x - 1$$

a b c