Review Lessons 4.1-4.3 Worksheet

Name: KEY

Graph the function by completing the table. Identify the graph's axis of symmetry, vertex, whether the graph opens up or down, and its maximum/minimum value. Then compare the graph with the graph of $y = x^2$.

1.) $y = -3x^2 + 5$

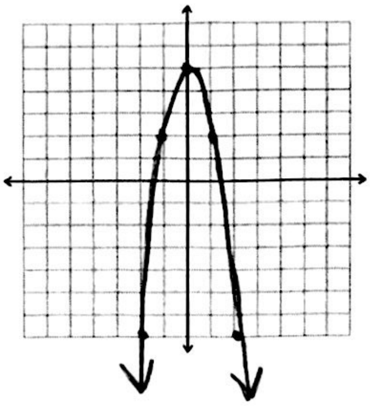
AOS: $x=0$

vertex: $(0,5)$

opens: down

max./min. value:

$y=5$



x	-2	-1	0	1	2
y	-7	2	5	2	-7

comparison to $y = x^2$:

- reflection over x-axis
- vertical stretch
- shift up 5

2.) $y = \frac{1}{4}x^2 + 1$

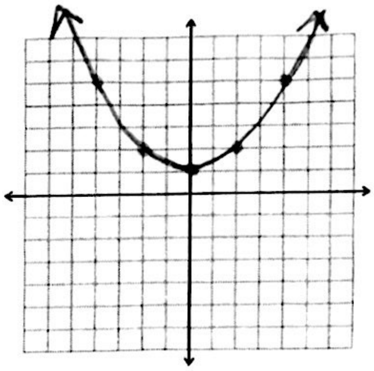
AOS: $x=0$

vertex: $(0,1)$

opens: up

max./min. value:

$y=1$



x	-4	-2	0	2	4
y	5	2	1	2	5

comparison to $y = x^2$:

- vertical shrink
- shift up 1

Identify the graph's axis of symmetry, vertex, *y*-intercept, whether the graph opens up or down, and its maximum/minimum value. Then graph the function by completing the table.

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

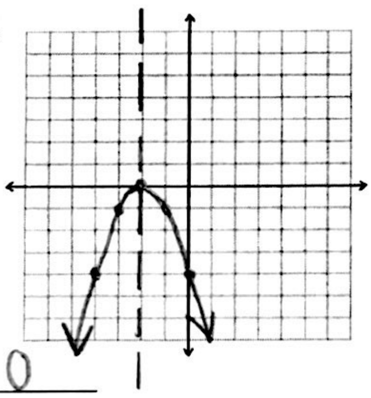
AOS: $x=-2$

vertex: $(-2,0)$

y-int: $(0,4)$

opens: down

max./min. value: $y=0$



x	-4	-3	-2	-1	0
y	-4	-1	0	-1	-4

work:

$x = \frac{-b}{2a} = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$

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

$= 0$

4.) $y = 3x^2 - 18x + 15$

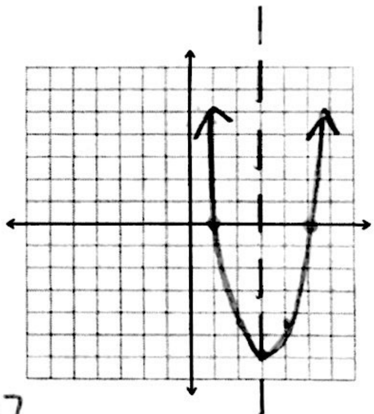
AOS: $x=3$

vertex: $(3,-12)$

y-int: $(0,15)$

opens: up

max./min. value: $y=-12$



y-axis by 2

x	1	2	3	4	5
y	0	-9	-12	-9	0

work:

$x = \frac{-b}{2a} = \frac{-(-18)}{2(3)} = \frac{18}{6} = 3$

$y = 3(3)^2 - 18(3) + 15$

$= -12$

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

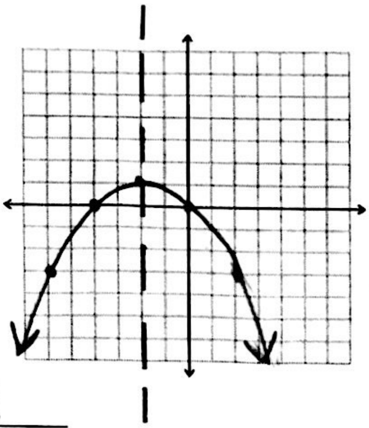
AOS: $x = -2$

vertex: $(-2, 1)$

y-int: $(0, 0)$

opens: down

max./min. value: $y = 1$



x	-6	-4	-2	0	2
y	-3	0	1	0	-3

work:

$y = -\frac{1}{4}(0+2)^2 + 1$
$= 0$

6.) $y = (x+4)^2$

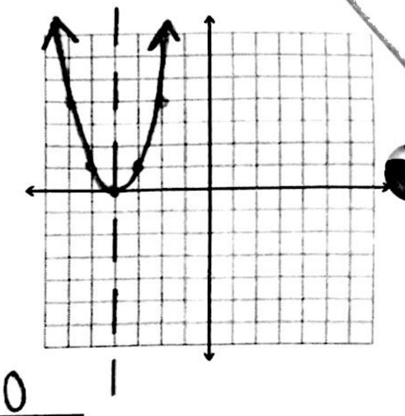
AOS: $x = -4$

vertex: $(-4, 0)$

y-int: $(0, 16)$

opens: up

max./min. value: $y = 0$



x	-6	-5	-4	-3	-2
y	4	1	0	1	4

work:

$y = (0+4)^2$
$= 16$

$(3,0)$ $(7,0)$

7.) $y = (x-3)(x-7)$

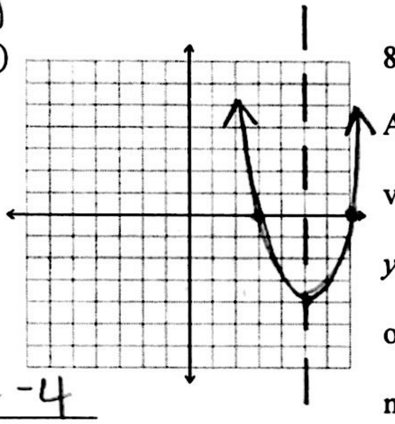
AOS: $x = 5$

vertex: $(5, -4)$

y-int: $(0, 21)$

opens: up

max./min. value: $y = -4$



x	3	4	5	6	7
y	0	-3	-4	-3	0

work:

$x = \frac{p+q}{2} = \frac{3+7}{2} = \frac{10}{2} = 5$

$y = (5-3)(5-7)$
$= -4$

$y = (0-3)(0-7)$
$= 21$

$(4,0)$ $(-1,0)$

8.) $f(x) = 2(x-4)(x+1)$

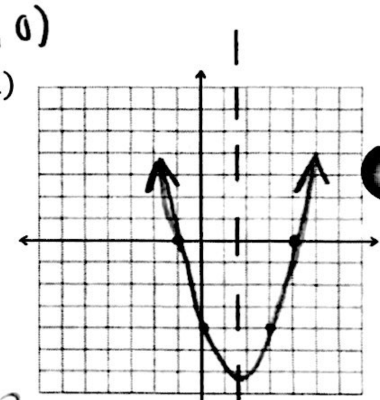
AOS: $x = 1.5$

vertex: $(1.5, -12.5)$

y-int: $(0, -8)$

opens: up

max./min. value: $y = -12$



y-axis by 2

x	-1	0	1.5	3	4
y	0	-8	-12.5	-8	0

work:

$x = \frac{p+q}{2} = \frac{4+-1}{2} = \frac{3}{2} = 1.5$

$y = 2(1.5-4)(1.5+1)$
$= -12.5$

Write the quadratic in ~~function~~ form. standard

9.) $y = -3(x+5)^2 - 1$

$y = -3(x+5)(x+5) - 1$
$= -3(x^2+5x+5x+25) - 1$
$= -3(x^2+10x+25) - 1$
$= -3x^2 - 30x - 75 - 1$
$\boxed{y = -3x^2 - 30x - 76}$

10.) $y = -7(x-6)(x+1)$

$y = -7(x^2+x-6x-6)$
$= -7(x^2-5x-6)$
$\boxed{y = -7x^2 + 35x + 42}$

Factor the expression completely, if possible.

11.) $x^2 - 4x + 4$

4
$1 + 4 = 5$
$2 + 2 = 4$
$-2 + -2 = 4$

$\boxed{(x-2)(x-2)}$

$\boxed{(x-2)^2}$

12.) $b^2 - 400$

* difference of squares

$(b)^2 \quad (20)^2$

$\boxed{(b+20)(b-20)}$

13.) $s^2 - 26s + 169$

169
$-1 + -169 = -170$
$-13 + -13 = -26$

$\boxed{(s-13)(s-13)}$

$\boxed{(s-13)^2}$

14.) $m^2 + 8m - 65$

-65
$-1 + 65 = 64$
$-5 + 13 = 8$

$\boxed{(m-5)(m+13)}$

Solve the equation using factoring.

15.) $x^2 - 11x + 30 = 0$

$(x-6)(x-5) = 0$

$x - 6 = 0$ $\quad$ $x - 5 = 0$

$\boxed{x = 6}$ $\quad$ $\boxed{x = 5}$

16.) $m^2 = 7m$

$-7m \quad -7m$

$m^2 - 7m = 0$

$m(m-7) = 0$

$m - 7 = 0$

$\boxed{m = 0}$ $\quad$ $\boxed{m = 7}$

17.) $r^2 + 2r = 80$

$r^2 + 2r - 80 = 0$

$(r+10)(r-8) = 0$

$r + 10 = 0$ $\quad$ $r - 8 = 0$

$\boxed{r = -10}$ $\quad$ $\boxed{r = 8}$

Find the zeros of the quadratic function.

18.) $y = x^2 - 8x + 16$

$0 = (x-4)(x-4)$

$x - 4 = 0$ $\quad$ $x - 4 = 0$

$\boxed{x = 4}$ $\quad$ $\boxed{x = 4}$

19.) $f(x) = n^2 - 12n$

$0 = n(n-12)$

$n - 12 = 0$

$\boxed{n = 0}$ $\quad$ $\boxed{n = 12}$

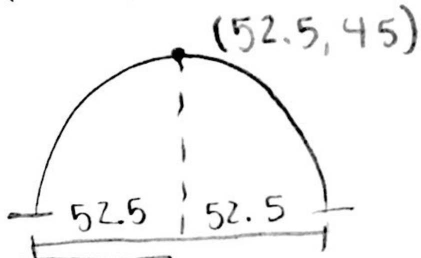
20.) $y = x^2 - 64$

$0 = (x-8)(x+8)$

$x - 8 = 0$ $\quad$ $x + 8 = 0$

$\boxed{x = 8}$ $\quad$ $\boxed{x = -8}$

21.) The arch of the Gateshead Millennium Bridge forms a parabola with equation $y = -0.016(x - 52.5)^2 + 45$ where x is the horizontal distance (in meters) from the arch's left end and y is the distance (in meters) from the base of the arch.



What is the width of the arch?

vertex: (52.5, 45)

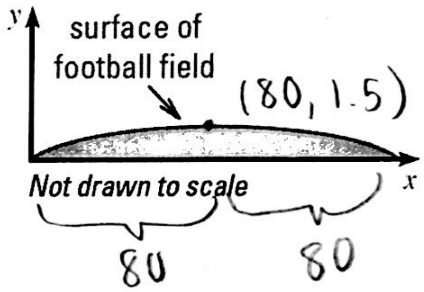
$52.5 + 52.5 = \boxed{105 \text{ meters}} \rightarrow$ arc width

22.) Although a football field appears to be flat, its surface is actually shaped like a parabola so that rain runs off to both sides. The cross section of a field with synthetic turf can be modeld by

(0, 0) (160, 0)

$y = -0.000234x(x - 160)$

where x and y are measured in feet.



a.) What is the field's width?

$80 + 80 = \boxed{160 \text{ ft}}$

b.) What is the maximum height of the field's surface?

$x = \frac{160 + 0}{2} = 80$

$y = -0.000234(80)(80 - 160)$

≈ 1.4976 ft

max height $\approx \boxed{1.5 \text{ ft}}$