Name: SOLUTION

WORKSHEET: Using Transformations to Graph Quadratic Functions

Describe the following transformations on the function $y = x^2$.

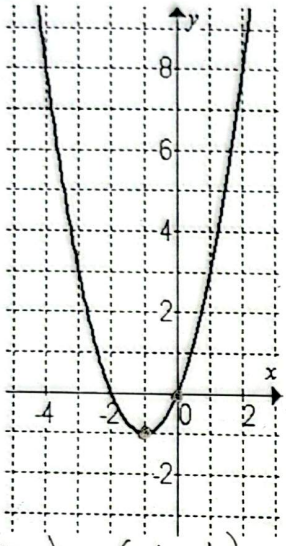
1. $y = -(x-2)^2$ - Vertical Reflection - Translated RIGHT 2	2. $y = (x+3)^2 - 1$ - Translated LEFT 3 - Translated DOWN 1
3. $y = 3x^2 + 1$ - Vertical stretch by 3 - Translated UP 1	4. $y = -2x^2$ - Vertical Reflection - Vertical stretch by 2
5. $y = -x^2 - 5$ - Vertical reflection - Translated DOWN 5	6. $y = 3(x+1)^2$ - Vertical stretch by 3 - Translated LEFT 1
7. $y = \frac{1}{3}(x+2)^2 + 3$ - vertical stretch by $\frac{1}{3}$ (OR vertical compression by 3) - Translated LEFT 2 - Translated UP 3	8. $y = -\frac{1}{2}(x-1)^2 + 3$ - Vertical Reflection - Vertical stretch by $\frac{1}{2}$ (OR compression by 2) - Translated RIGHT 1 - Translated UP 3
9. $y = (x+3)^2$ - Translated LEFT 3	10. $y = -(x-1)^2 + 4$ - Vertical Reflection - Translated RIGHT 1 - Translated UP 4

Write the equation for the function $y = x^2$ with the following transformations.

11. reflect across the x-axis, shift down 1 $-x^2$ x^2-1 $y = -x^2 - 1$	12. vertically stretch by a factor of 3, shift right 5 and up 1 $3x^2$ $(x-5)^2$ x^2+1 $y = 3(x-5)^2 + 1$
13. shift up 5 $y = x^2 + 5$	14. reflect across the x-axis, shift down 8 $-x^2$ x^2-8 $y = -x^2 - 8$
15. reflect across the x-axis and vertically compress by a factor of 2 $\frac{1}{2}x^2$ $y = -\frac{1}{2}x^2$	16. vertically stretch by a factor of 4, shift left 3 and down 2 $4x^2$ $(x+3)^2$ x^2-2 $y = 4(x+3)^2 - 2$

Write the equation for each quadratic relation with the following graphs

17.

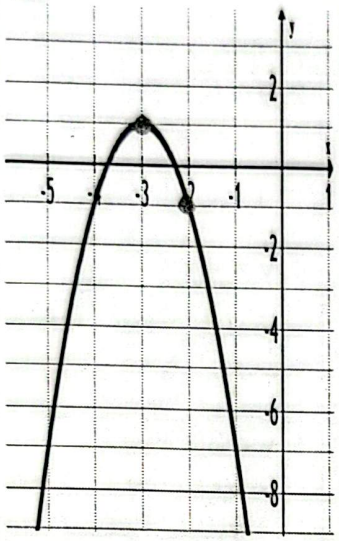


Vertex $(-1, -1)$
$h \quad k$

$a = 1$

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

18.

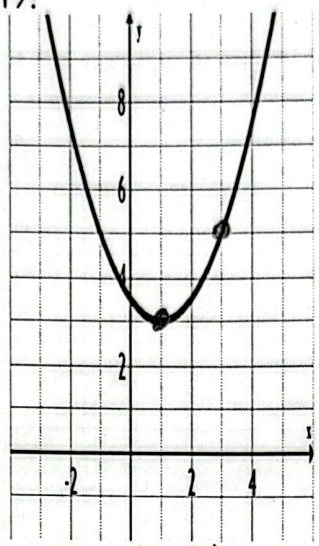


Vertex $(-3, 1)$
$h \quad k$

$a = -2$

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

19.

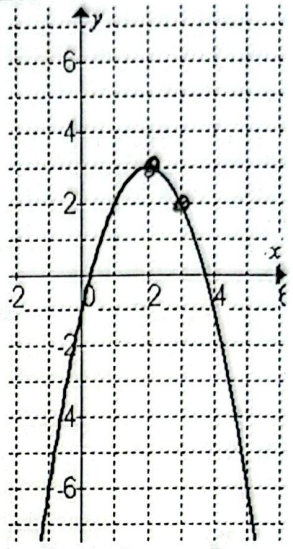


Vertex $(1, 3)$
$h \quad k$

$a = \frac{1}{2}$

$y = \frac{1}{2}(x-1)^2 + 3$

20.



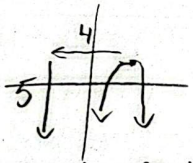
Vertex $(2, 3)$
$h \quad k$

$a = -1$

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

21. If you wanted to shift $y = -3(x-2)^2 + 1$ down 4 and left 5 what would be the new equation?

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



Vertex $(2, 1)$
$-5 \quad -4$
$\downarrow$
$(-3, -3)$

22. If you wanted to shift $y = x^2 + 3$ left 2 and up 5 what would be the new equation?

Vertex $(0, 3)$
$-2 \quad +5$
$\hookrightarrow (-2, 8)$

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

23. If you wanted to shift $y = (x+4)^2$ down 3 and right 2 what would be the new equation?

Vertex $(-4, 0)$
$+2 \quad -3$
$\hookrightarrow (-2, -3)$

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

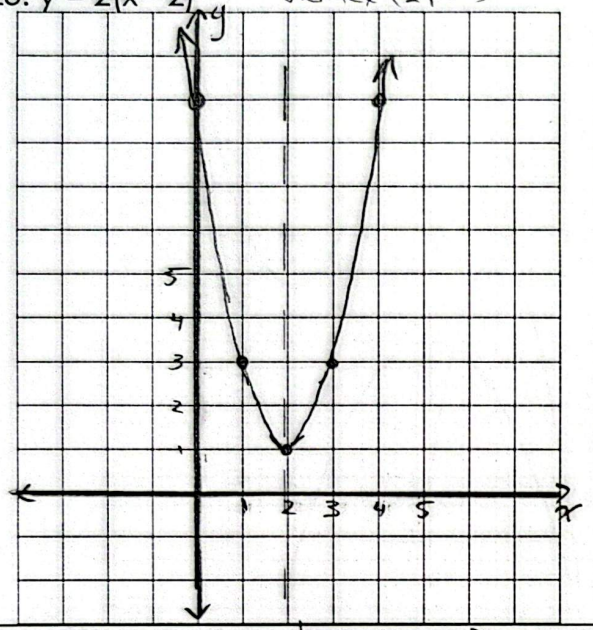
24. If you wanted to shift $y = -x^2$ right 3 and up 5 what would be the new equation?

Vertex $(0, 0)$
$+3 \quad +5$
$\hookrightarrow (3, 5)$

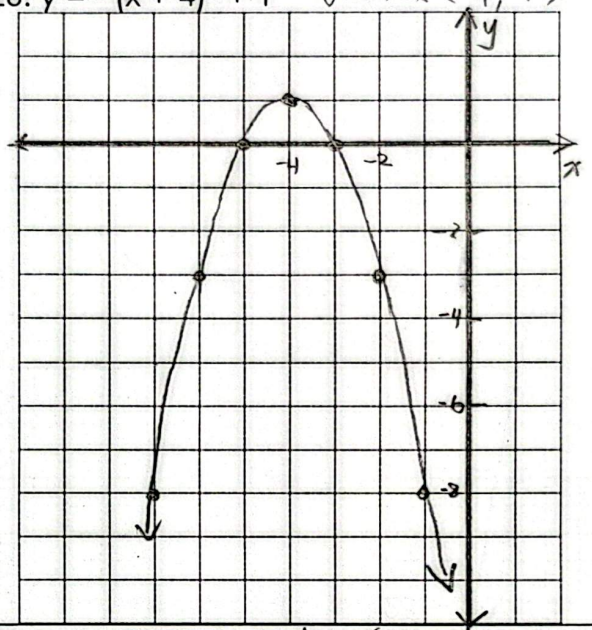
$y = -(x-3)^2 + 5$

Use transformations to graph each quadratic function. Take care when planning the location of your axis.

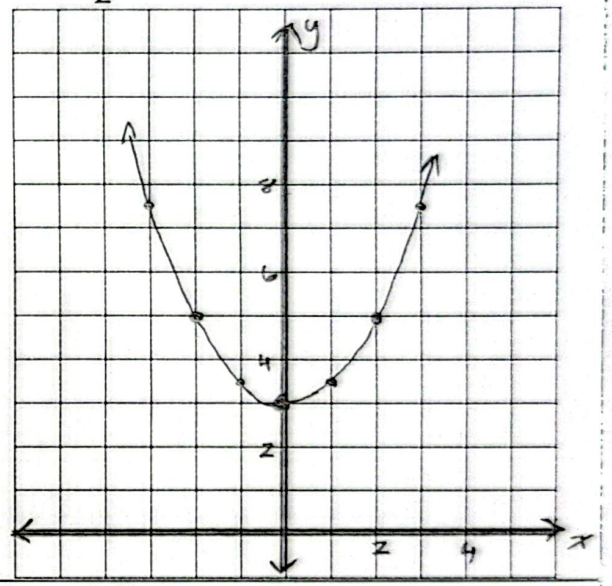
25. $y = 2(x - 2)^2$ Vertex (2, 0)



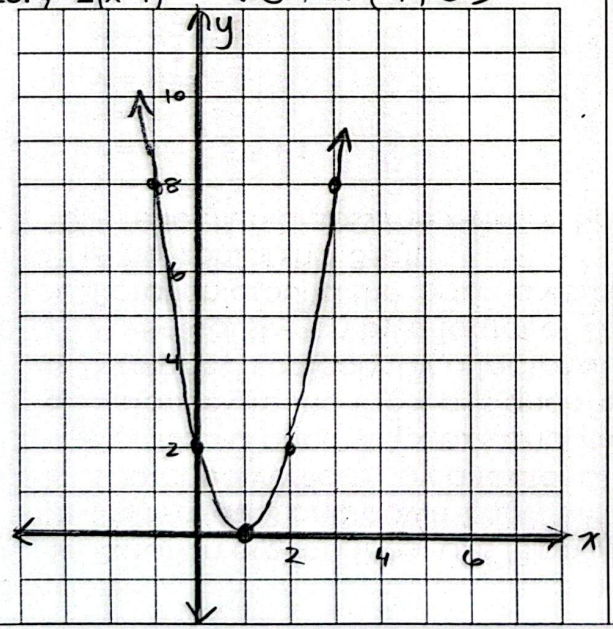
26. $y = -(x + 4)^2 + 1$ Vertex (-4, 1)



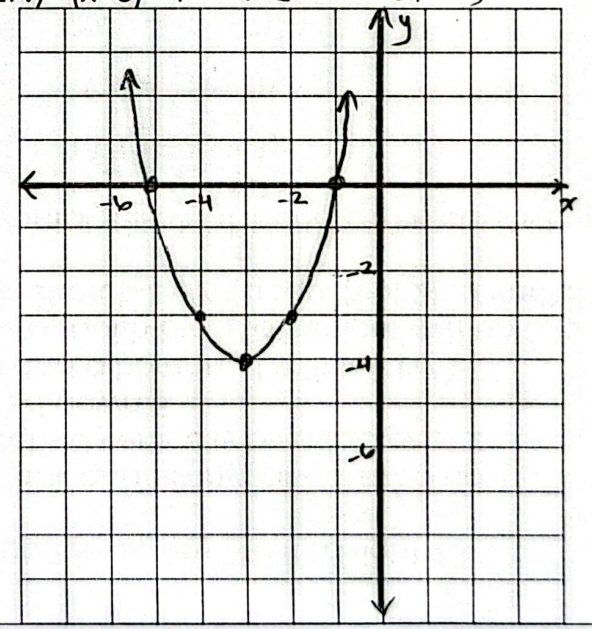
27. $y = \frac{1}{2}x^2 + 3$ Vertex (0, 3)



28. $y = 2(x-1)^2$ Vertex (1, 0)



29. $y = (x+3)^2 - 4$ Vertex (-3, -4)



30. $y = -\frac{1}{2}(x+2)^2$ Vertex (-2, 0)

