Transformations of y = x²: shifts, stretches and reflections worksheet – Grade 11

Grade 11 · Mixed level · 20 questions · **Version X1835**

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Write it like x = 4. · Write it like (2, −3). · Write it like (3, −2).

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1. What is the equation of the axis of symmetry of $y = 2(x - 7)^2 - 3$?

   Answer: _____

2. What is the vertex of $y = -2(x - 1)^2 - 8$?

   Answer: _____

3. The graph of $y = x^2$ is moved 3 units to the right. What is the new equation?

   A. $y = x^2 - 3$ **B.** $y = x^2 + 3$ **C.** $y = (x - 3)^2$ **D.** $y = (x + 3)^2$

4. How is $y = -x^2$ transformed from $y = x^2$?

   A. Vertical compression by a factor of 1/2 **B.** 1 down **C.** Reflection in the x-axis **D.** Reflection in the y-axis

5. Work out the equation of the axis of symmetry of $y = -3(x + 7)^2 - 3$.

   Answer: _____

6. Find the vertex of $y = 3(x + 2)^2 - 4$.

   Answer: _____

7. Find the equation of the axis of symmetry of $y = \frac{1}{3}(x + 3)^2 + 6$.

   Answer: _____

8. What are the domain and range of $y = \frac{1}{3}(x - 6)^2 + 9$?

   A. Domain: all real numbers. Range: y ≥ 9 **B.** Domain: all real numbers. Range: y ≤ 9 **C.** Domain: all real numbers. Range: y ≥ 6 **D.** Domain: x ≥ 6. Range: y ≥ 9

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9. $y = x^2$ has these transformations: vertical compression by a factor of 1/2, translation 5 left, 1 down. What is the new equation?

   A. $y = \frac{1}{2}(x+1)^2 - 5$ **B.** $y = \frac{1}{2}(x+5)^2 - 1$ **C.** $y = \frac{1}{2}(x-5)^2 - 1$

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

10. $y = x^2$ has these transformations: reflection in the x-axis, translation 3 right, 7 down. What is the new equation?

    A. $y = -(x+3)^2 - 7$ **B.** $y = (x-3)^2 - 7$ **C.** $y = -(x-3)^2 - 7$

    D. $y = -(x+7)^2 + 3$

11. (3, 9) is on $y = x^2$. What is its image on $y = 3(x-2)^2 - 9$?

    Answer: _____

12. Which describes how $y = -(x+6)^2 + 2$ is transformed from $y = x^2$?

    A. Reflection in the x-axis, translation 6 right, 2 up

    B. Reflection in the x-axis, translation 2 right, 6 down **C.** Translation 6 left, 2 up

    D. Reflection in the x-axis, translation 6 left, 2 up

13. What are the domain and range of $y = \frac{1}{2}(x+1)^2 + 1$?

    A. Domain: x ≥ −1. Range: y ≥ 1 **B.** Domain: all real numbers. Range: y ≤ 1

    C. Domain: all real numbers. Range: y ≥ −1 **D.** Domain: all real numbers. Range: y ≥ 1

14. $y = x^2$ has these transformations: vertical stretch by a factor of 2, translation 4 left, 9 up. What is the new equation?

    A. $y = -2(x+4)^2 + 9$ **B.** $y = 2(x-4)^2 + 9$ **C.** $y = 2(x-9)^2 - 4$

    D. $y = 2(x+4)^2 + 9$

15. Which describes how $y = -2\left[\frac{1}{3}(x-6)\right]^2 + 7$ is transformed from $y = x^2$?

    A. Vertical stretch by a factor of 2, horizontal stretch by a factor of 3, translation 6 right, 7 up

    B. Vertical stretch by a factor of 2, reflection in the x-axis, horizontal stretch by a factor of 3, translation 6 right, 7 up

    C. Vertical stretch by a factor of 2, reflection in the x-axis, horizontal stretch by a factor of 3, translation 6 left, 7 up

    D. Vertical stretch by a factor of 2, reflection in the x-axis, horizontal compression by a factor of 1/3, translation 6 right, 7 up

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16. $y = x^2$ has these transformations: horizontal stretch by a factor of 2, translation 6 right, 5 up. What is the new equation?

    A. $y = (x-6)^2 + 5$ **B.** $y = \left[\frac{1}{2}(x+6)\right]^2 + 5$ **C.** $y = [2(x-6)]^2 + 5$

    D. $y = \left[\frac{1}{2}(x-6)\right]^2 + 5$

17. $y = (2x)^2$ is a horizontal compression. It gives the same graph as $y = ax^2$. What is a?

    Answer: _____

18. $y = x^2$ has these transformations: reflection in the x-axis, horizontal stretch by a factor of 3, translation 4 right, 6 up. What is the new equation?

    A. $y = -\left[\frac{1}{3}(x-4)\right]^2 + 6$ **B.** $y = -(x-4)^2 + 6$ **C.** $y = -\left[\frac{1}{3}(x+4)\right]^2 + 6$

    D. $y = -[3(x-4)]^2 + 6$

19. $y = x^2$ has these transformations: vertical stretch by a factor of 2, horizontal compression by a factor of 1/3, translation 2 left, 4 down. What is the new equation?

    A. $y = 2[3(x+2)]^2 - 4$ **B.** $y = 2[3(x-2)]^2 - 4$ **C.** $y = 2\left[\frac{1}{3}(x+2)\right]^2 - 4$

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

20. Work out the horizontal translation of $y = (2x-2)^2 + 8$.

    A. 1 left **B.** 2 left **C.** 2 right **D.** 1 right

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Answer key · Version X1835

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1. **x = 7**
2. **(1, −8)**
3. **C (**$y = (x - 3)^2$**)**
4. **C (Reflection in the x-axis)**
5. **x = −7**
6. **(−2, −4)**
7. **x = −3**
8. **A (Domain: all real numbers. Range: y ≥ 9)**
9. **B (**$y = \frac{1}{2}(x + 5)^2 - 1$**)**
10. **C (**$y = -(x - 3)^2 - 7$**)**
11. **(5, 18)**
12. **D (Reflection in the x-axis, translation 6 left, 2 up)**
13. **D (Domain: all real numbers. Range: y ≥ 1)**
14. **D (**$y = 2(x + 4)^2 + 9$**)**
15. **B (Vertical stretch by a factor of 2, reflection in the x-axis, horizontal stretch by a factor of 3, translation 6 right, 7 up)**
16. **D (**$y = \left[\frac{1}{2}(x - 6)\right]^2 + 5$**)**
17. **4**
18. **A (**$y = -\left[\frac{1}{3}(x - 4)\right]^2 + 6$**)**
19. **A (**$y = 2\left[3(x + 2)\right]^2 - 4$**)**
20. **D (1 right)**

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