Function/Graph Transformation Quiz Review

**Students Will Be Able To:**

- Recognize the basic graphs including: \(y = x, y = x^2, y = x^3, y = |x|, x^2 + y^2 = 1,\)
  \(y = 2^x, y = \sqrt{x}, \) and \(y = \frac{1}{x} \).
- Translate basic graphs up down, left and right and determine the resultant equation.
- Reflect basic graphs over the x-axis or the y-axis.
- Dilate (stretch or shrink) graphs by a given factor.
- Compose multiple transformations.

**Basic Graphs:** Sketch each of the basic graphs below. Show at least 3, preferably 5 specific points.
Reference Information

Translations of $y = f(x)$: (Assume that $a$ is a positive number.)

<table>
<thead>
<tr>
<th>$y + a = f(x)$</th>
<th>$y = f(x) - a$</th>
<th>Results in the graph shifting down $a$ units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y - a = f(x)$</td>
<td>$y = f(x) + a$</td>
<td>Results in the graph shifting up $a$ units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$y = f(x + a)$</th>
<th>Results in the graph shifting left $a$ units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = f(x - a)$</td>
<td>Results in the graph shifting right $a$ units</td>
</tr>
</tbody>
</table>

Reflections of $y = f(x)$:

<table>
<thead>
<tr>
<th>$y = -f(x)$</th>
<th>Results in the graph reflecting over the x-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = f(-x)$</td>
<td>Results in the graph reflecting over the y-axis</td>
</tr>
</tbody>
</table>

Scalings of $y = f(x)$:

<table>
<thead>
<tr>
<th>$y = af(x)$</th>
<th>Results in the graph becoming $a$ times as tall</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = \frac{1}{a} f(x)$ OR $ay = f(x)$</td>
<td>Results in the graph becoming $\frac{1}{a}$ times as tall</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$y = f(ax)$</th>
<th>Results in the graph becoming $\frac{1}{a}$ times as wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = f\left(\frac{1}{a}x\right)$</td>
<td>Results in the graph becoming $a$ times as wide</td>
</tr>
</tbody>
</table>

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Practice Problems: Do these problems WITHOUT YOUR CALCULATOR as you will not have that tool when you take the quiz.

Directions: Each description or graph represents a different transformation or combination of transformations of some “parent” function. Fill in the missing information

<table>
<thead>
<tr>
<th></th>
<th>Equation:</th>
<th>Description:</th>
<th>Graph:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$y = x$</td>
<td>The graph of $y = x$ is shifted up 2 and is $\frac{1}{3}$ as wide.</td>
<td><img src="image1.png" alt="Graph" /></td>
</tr>
<tr>
<td>2</td>
<td>$y = -\frac{1}{2}x^2 + 3$</td>
<td></td>
<td><img src="image2.png" alt="Graph" /></td>
</tr>
<tr>
<td>3</td>
<td>$y = x^3$</td>
<td>The graph of $y = x^3$ is made twice as tall and is reflected over the y-axis.</td>
<td><img src="image3.png" alt="Graph" /></td>
</tr>
<tr>
<td>4</td>
<td>$y = -4</td>
<td>x - 4</td>
<td>$</td>
</tr>
</tbody>
</table>
5. Equation: \(-y = \sqrt{4x}\)
   Description:

   Graph:

6. Equation:
   Description: The graph of \(2^x\) is reflected over the y-axis and shifted down 5 units.

   Graph:

7. Equation: \(-\frac{1}{x-3} + 2\)
   Description:

   Graph:

8. Equation:
   Description: The graph of \(x^2 + y^2 = 25\) is made twice as tall and shifted left 4 units.

   Graph:
Directions: Each of the following figures is one of the basic graphs with one or more transformation performed on it. For each one,

a. Identify the parent function.

b. Describe in writing the transformation(s) that was/were performed.

c. Write an equation for the new function.

9.

a. 

b. 

c. 

10.

a. 

b. 

c. 

11.

a. 

b. 

c. 

12.

a. 

b. 

c.
13. a. Identify the parent function.
b. Describe in writing the transformation(s) that was/were performed.
c. Write an equation for the new function.

14. a. 

15. a. 

16. a. 

Mixed Review from the textbook.

<table>
<thead>
<tr>
<th>Question</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>17. Sketch the graph of</strong> $y = 3</td>
<td>x - 1</td>
</tr>
<tr>
<td><strong>Describe how your graph related to the graph of</strong> $y =</td>
<td>x</td>
</tr>
<tr>
<td><strong>18. Sketch the graph of</strong> $\left(\frac{x}{2}\right)^2 + (3y)^2 = 36$.</td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td><strong>How is your graph related to the graph of</strong> $x^2 + y^2 = 36$?</td>
<td></td>
</tr>
<tr>
<td><strong>19. Write an equation for a function with a graph that is the graph of</strong> $y = x^3$ <strong>after a translation 3 units to the left and 1 unit up.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>20. Write an equation for a function with a graph that is the graph of</strong> $y = \frac{1}{x}$ <strong>made 6 times as wide.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>21. How are the graphs of</strong> $y = x^2$ <strong>and</strong> $y = (x - 3)^2$ <strong>related?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>22. What does this graph look like?</strong></td>
<td><strong>$(x + 1)^2 + (y - 4)^2 = 36$</strong></td>
</tr>
<tr>
<td><strong>23. What does the graph of</strong> $-2y = x^3$ <strong>look like?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>24. What does this graph look like?</strong></td>
<td><strong>$(3x)^2 + (2y)^2 = 36$</strong></td>
</tr>
</tbody>
</table>
1. \( y = 3x + 2 \)

2. The graph is reflected over the \( x \)-axis, is shifted up 3 units and is half as tall.

3. \( y = -2x^2 \)

4. The graph is reflected over the \( x \)-axis, shifted 4 to the right and made 4 times as tall.

5. The graph is reflected over the \( x \)-axis and made \( \frac{1}{4} \) as wide.

6. \( y = 2^{x-5} - 5 \)

7. The graph is reflected over the \( x \)-axis and shifted right 3 and up 2.

8. \((x + 4)^2 + \left(\frac{y}{3}\right)^2 = 25\)

9. \( y = \sqrt{x} \)
   a. \( y = x^2 \)
   b. The graph is shifted left three units and is twice as tall.
   c. \( y = 2\sqrt{x} + 3 \)

10. \( y = x^3 \)
    a. \( y = 2^x \)
    b. The graph is shifted down 4 and is twice as tall.
    c. \( y = 2x^3 - 4 \)

11. \( x^2 + y^2 = 25 \)
    a. \( x^2 + y^2 = 25 \)
    b. The graph is shifted down 3 and right 4.
    c. \( (x - 4)^2 + (y + 3)^2 = 25 \)

12. \( y = \frac{1}{x} \)
    a. \( y = \frac{1}{x} \)
    b. The graph is shifted down 3 and left 6.
    c. \( y = \frac{1}{x+6} - 3 \)

13. \( y = x^3 \)
    a. \( y = 2^x \)
    b. The graph is reflected across the \( x \)-axis and is shifted right 5.
    c. \( y = -2^{x-5} \)

14. \( y = x \)
    a. \( y = |x| \)
    b. The graph is shifted right 2 and is \( \frac{1}{2} \) as tall.
    c. \( y = \frac{1}{2}|x - 2| \)

15. \( y = -2x - 5 \)

16. \( y = (x + 3)^3 + 1 \)

17. The graph of \( y = (x - 3)^2 \) is the graph of \( y = x^2 \) shifted 3 units to the right.

18. The graph is a circle with a radius of 6 and a center of \((-1, 4)\)

19. \( y = \frac{6}{x} \)

20. The graph of \( -2y = x^2 \) looks like the graph of \( y = x^3 \) reflected over the \( x \)-axis and made \( \frac{1}{2} \) as tall.

21. The graph is a circle with a radius of 6 that is scaled to be \( \frac{1}{2} \) as wide and \( \frac{1}{2} \) as tall (so it actually is an ellipse, not a circle)