Activity 1.5 - Answer Key

Problem 1

True of False: The graph of $y = f(ax)$ is a vertical compression of the graph $y = f(x)$ if $0 < a < 1$.

False: The a would cause a horizontal stretch in this case.

Problem 2

True of False: The graph $y = |x - 3|$ is a horizontal shift left 3 units from $y = |x|$.

False: This would actually be a horizontal shift 3 units to the right.

Problem 3

Describe the transformation of: $\sqrt{x - 3} - 4$

The overall transformation applied to the basic square root function $g(x) = \sqrt{x}$ to obtain $f(x) = \sqrt{x - 3} - 4$ can be described as follows:

- Horizontal shift to the right by 3 units.

- Vertical shift downward by 4 units.

Problem 4

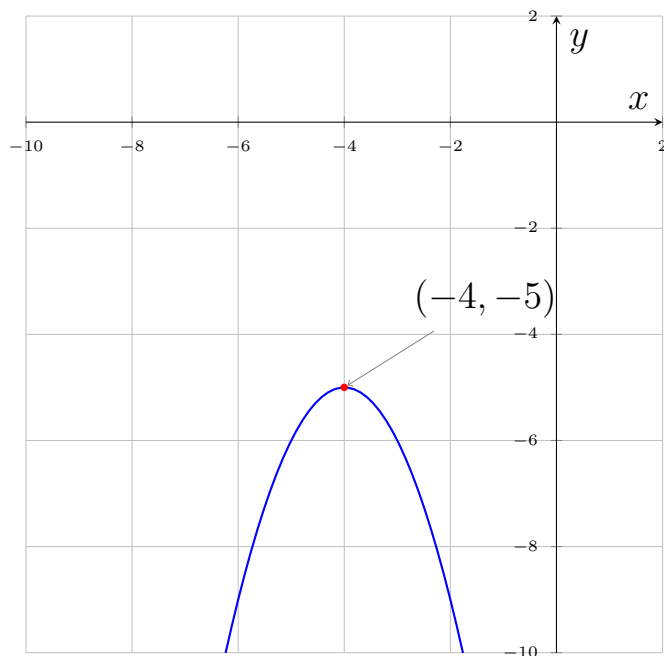Describe the transformation of: $-\frac{1}{4}(x + 8)^3 + 7$

The overall transformation applied to the basic cubic function $g(x) = x^3$ to obtain $f(x) = -\frac{1}{4}(x + 8)^3 + 7$ can be described as follows:

- Horizontal shift to the left by 8 units.

- Vertical compression by a factor of $\frac{1}{4}$.

- Reflection over the x-axis.

- Vertical shift upward by 7 units.

Problem 5

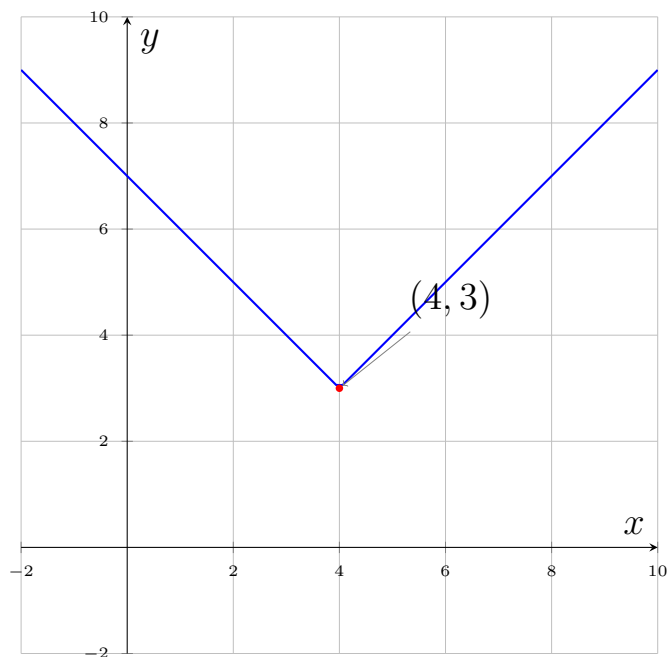Sketch the graph of $f(x) = -(x+4)^2 - 5$

Problem 6

Sketch the graph of $f(x) = |x-4| + 3$

> **Problem 7**
>
> Write a function that fits the following description. The graph $f(x) = x^2$ that is reflected over the y-axis and shifted down 4 units.

Step 1: Reflect Over the y-axis

To reflect the graph over the y-axis, we replace x with $-x$ (or place a negative on the inside of the function).

$$g(x) = (-x)^2$$

Step 2: Shift Downward by 4 Units

To shift the graph downward by 4 units, we subtract 4 from the function $g(x) = (-x)^2$. The final function is:

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

Conclusion

The function that fits the given description is:

$$\boxed{h(x) = (-x)^2 - 4}$$

This function represents the graph of $f(x) = x^2$ that is reflected over the y-axis (which has no effect due to the even nature of the function) and shifted downward by 4 units.

> **Problem 8**
>
> Write a function that fits the following description. The graph $f(x) = |x|$ that is shifted right 2 units, reflected over the x-axis, and shifted down 3 units.

Step 1: Shift Right by 2 Units

To shift the graph to the right by 2 units, we replace x with $x - 2$ in the function.

$$k(x) = |x - 2|$$

Step 2: Reflect Over the x-axis

To reflect the graph over the x-axis, we place a negative on the outside of the function. The new function is:

$$g(x) = -|x - 2|$$

Step 3: Shift Downward by 3 Units

To shift the graph downward by 3 units, we subtract 3 from the outside of the function. The function becomes:

$$h(x) = -|x - 2| - 3$$

Conclusion

The function that fits the given description is:

$$\boxed{h(x) = -|x - 2| - 3}$$