

PRINCIPLES OF MATHEMATICS 12

UNIT 1 Review

The first unit test for this course will cover material from the following sections in MATHPOWER 12:

- 1.1 Horizontal and Vertical Translations of Functions
- 1.3 Reflections
- 1.4 Stretches of Functions
- 1.6 Combinations of Transformations
- 1.7 Reciprocal Functions and Absolute Value Functions

Complete each of these examples.

Horizontal and Vertical Translations of Functions

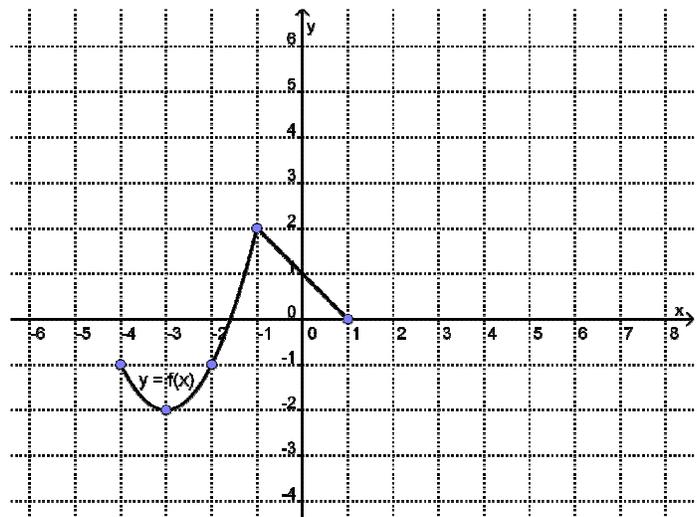
1. State in each case exactly how the graph of $y = f(x)$ is transformed to the graph of $y = f(x - h) + k$.

- $h > 0$ and $k = 0$
- $h < 0$ and $k > 0$
- $h > 0$ and $k < 0$

2. The following graph is that of $y = f(x)$. On the same grid draw the graphs of the following functions.

a) $y = f(x + 2) - 3$

b) $y = f(x - 5) + 1$



Reflections

3. State in each case how the graph of $y = f(x)$ is transformed.

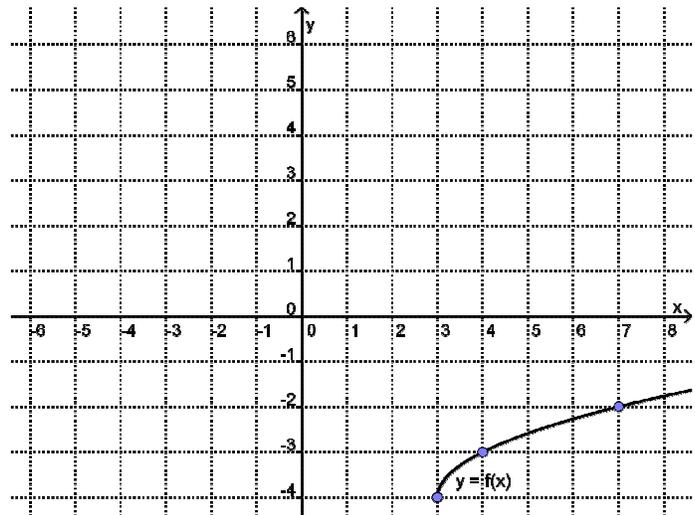
- $y = -f(x)$
- $y = f(-x)$
- $y = f^{-1}(x)$

4. Suppose that $f(x) = \sqrt{x-3} - 4$. For each case change $y = \sqrt{x-3} - 4$ to suit the stated transformation, then draw the graph on the grid below.

a) $y = -f(x)$

b) $y = f(-x)$

c) $y = f^{-1}(x)$



Expansions and Compressions

5. State in each case exactly how the graph of $y = f(x)$ is transformed by the change to the function.

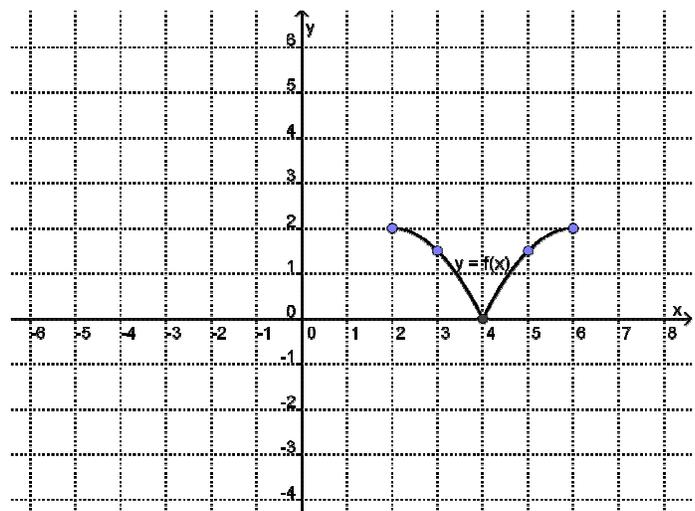
- $y = af(x)$, where $0 < a < 1$
- $y = f(kx)$, where $0 < k < 1$
- $y = af(x)$, where $a > 1$
- $y = f(kx)$, where $k > 1$

6. For each of the following cases state what transformation(s) to the graph of $y = f(x)$ will occur, and draw the graph with the transformation(s).

a) $y = 3f(x)$

b) $y = f(2x)$

c) $y = 3f(2x)$



Combinations of Transformations

7. Suppose that $f(x) = x^2$. In each of the following cases, state exactly how the graph of $y = f(x)$ will be transformed.

- $y = -\left(\frac{1}{5}x\right)^2 + 2$
- $y = 2(-x + 4)^2$
- $y = -(-x)^2 - 7$
- $y = -\frac{1}{3}(2x + 2)^2 + 5$

8. Suppose that $f(x) = |x|$. In each of the following cases, modify the equation to match the given transformation of the graph of $y = f(x)$.

- A horizontal expansion to 3 times its original width, and a horizontal translation by 4 units right and a vertical translation of 7 units down.
- A vertical expansion to 4 times its original height, followed by a reflection in the x-axis, and a horizontal translation of 3 units to the left.
- A vertical compression to $\frac{1}{2}$ its original height and a horizontal compression to $\frac{1}{4}$ its original width, followed by a reflection in the y-axis, plus a horizontal translation of 1 unit to the left and vertical translation of 5 units down.

9. Suppose that $f(x) = \frac{1}{2}(x - 1)^2 - 3$. In each of the following cases, state exactly how the graph of $y = f(x)$ will be transformed.

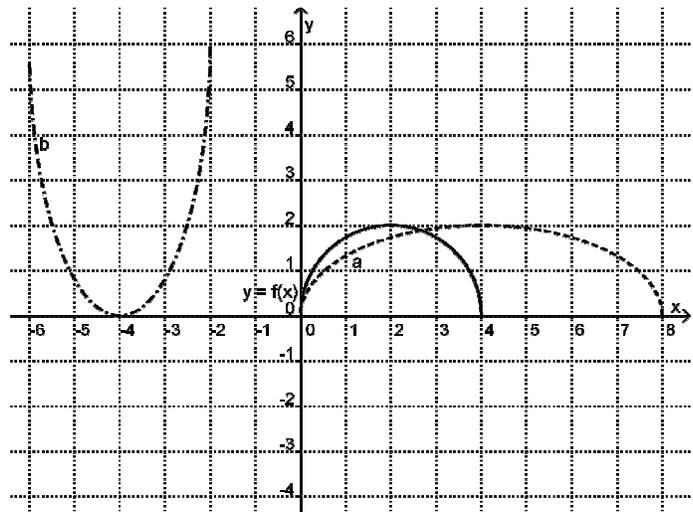
- $y = \frac{1}{2}(-x - 1)^2 - 5$

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

- $y = -\frac{1}{4}(x - 6)^2 - 4$

10. Compare each of graphs **a** and **b** to that of the semicircle, $y = f(x)$. In each case, state what transformations occurred (in the correct order), then write equations for those graphs in modified $y = f(x)$ form.

a) Transformations:



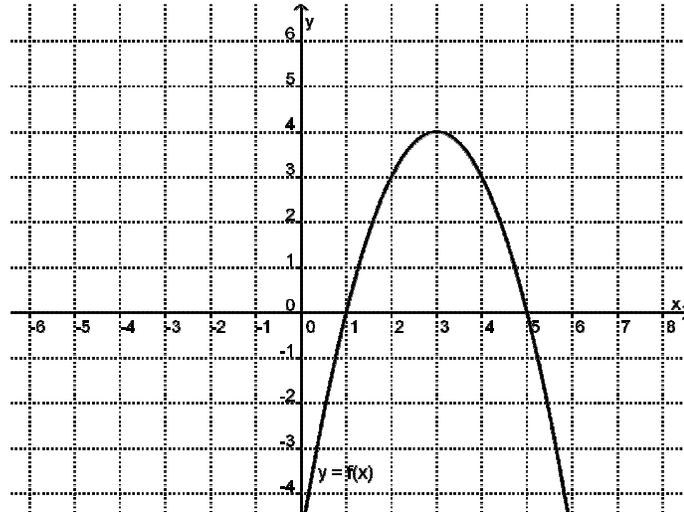
Equation:

b) Transformations:

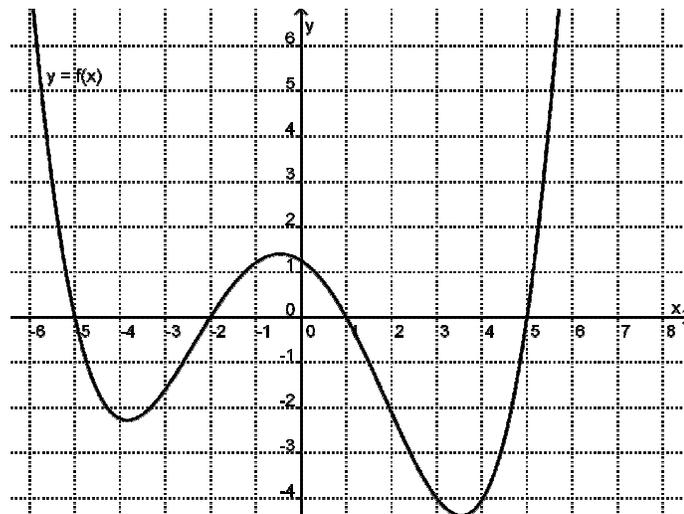
Equation:

Reciprocal Functions and Absolute Value Functions

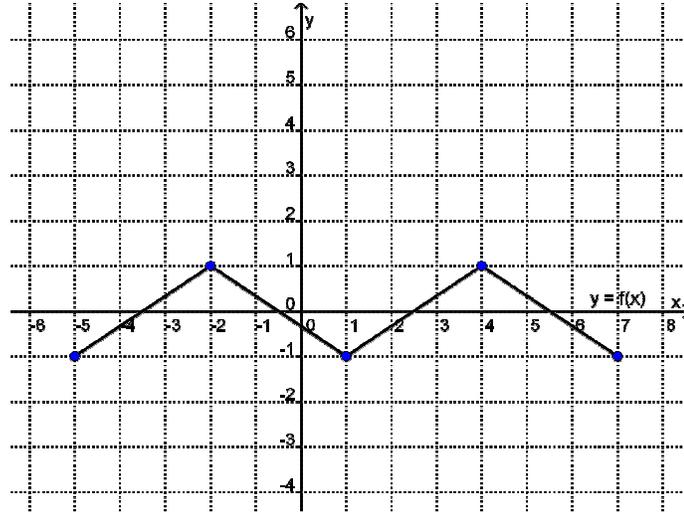
11. Given the graph of $y = f(x)$, carefully sketch the graph of $y = \frac{1}{f(x)}$ on the same graphing grid.



12. Given the graph of $y = f(x)$, carefully sketch the graph of $y = |f(x)|$ on the same graphing grid.



13. Given the graph of $y = f(x)$, carefully sketch the graph of $y = \frac{1}{|f(x)|}$ on the same graphing grid.



14. Given the function $f(x) = x(x - 2)(x + 2)$, sketch the graphs of $y = f(x)$, $y = \frac{1}{f(x)}$, and $y = |f(x)|$ on the same graphing grid.

