Warm Up 9/19/13

1. Define function

2. Evaluate the function at the indicated values.
   $f(x) = x^2 + 2x$; f(0), f(3), f(a + b)

3. Explain in words how the given parabola has been transformed from its standard form.

   $f(x) = -[3(-x - 4)^2 + 2]$

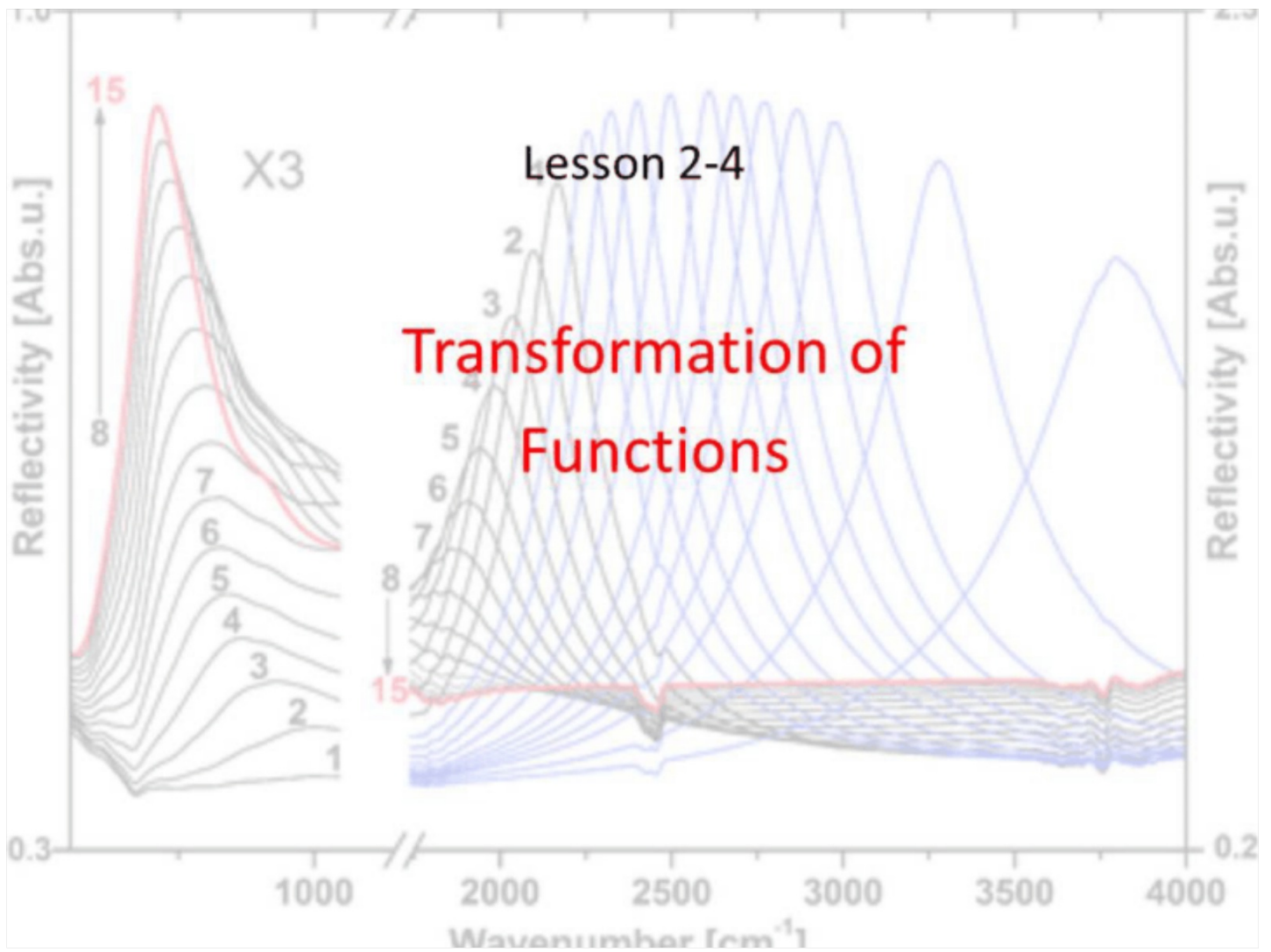# Warm Up Solutions

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Lesson 2-4

Transformation of Functions

Objective

Students will...

- Be able to understand the basic idea of transformation of functions.

- Explore and apply the properties of vertical and horizontal shifts, reflections, compression, and stretch, in graphing various functions.

Vertical Shifts

$y = f(x) \pm c$ shifts the graph of $y = f(x)$ upward(+) or downward(-) c units, for $c > 0$.

Ex. $y = x^2 \pm 4$ Ex. $y = x - 2$

Horizontal Shifts

$y = f(x \pm c)$ shifts the graph of $y = f(x)$ to the right(+) or left(-) c units, for $c > 0$.

Ex. $y = (x \pm 2)^2$ Ex. $y = |x - 2|$

Reflection

Along the y-axis (horizontal)

$y = f(-x)$ reflects the graph of $y = f(x)$ along the y-axis (horizontal reflection).

Along the x-axis (vertical)

$y = -f(x)$ reflects the graph of $y = f(x)$ along the x-axis (vertical reflection).

Ex. $y = (-x - 2)^2$ Ex. $y = -|x - 2|$

Vertical Stretch and Compression

For $y = cf(x)$

If $c > 1$, stretch the graph of $y = f(x)$ vertically by a factor of c.

If $0 < c < 1$, shrink the graph of $y = f(x)$ vertically by a factor of c.

Ex. $y = 3x^2$

Ex. $y = \frac{1}{2}x^2$

Horizontal Stretch and Compression

For $y = f(cx)$

If $c > 1$, shrink the graph of $y = f(x)$ horizontally by a factor of $\frac{1}{c}$

If $0 < c < 1$, stretch the graph of $y = f(x)$ horizontally by a factor of $\frac{1}{c}$

Ex. $y = (3x)^2$

Ex. $y = (\frac{1}{2}x)^2$

Examples

Suppose the graph of the function f is given. Describe how the graph of each function has been transformed (changed from its original position).

1. $y = f(x - 2) - 5$

2. $y = f(-x + 2)$

3. $y = \frac{1}{3}f(x)$

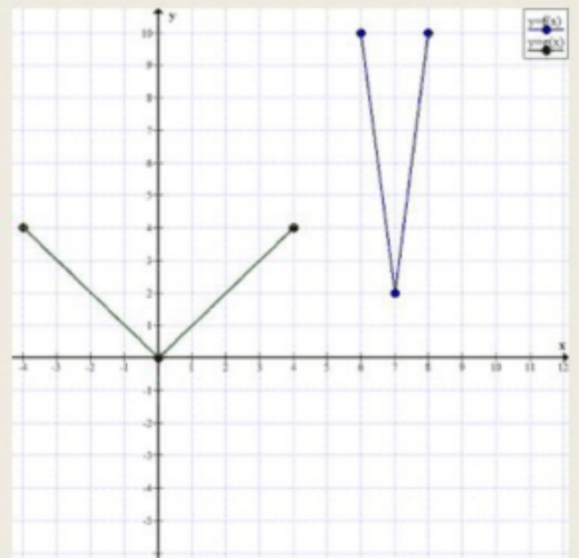4. $y = f\left(\frac{5}{2}x\right)$

Examples

Find a formula for the new graph.

1.

2.

Examples

Graph the following function.

1. $f(x) = x^3 + 2$

Examples

Graph the following function.

2. $f(x) = 2\sqrt{x + 1} - 1$