Warm Up 9/12

Determine whether f is even, odd, or neither.

a. $f(x) = 2x^5 - 3x^2 + 2$

$f(-x) = 2(-x)^5 - 3(-x)^2 + 2$

$= -2x^5 - 3x^2 + 2$

Neither.

b. $f(x) = \frac{1}{x+2}$

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

$= \frac{1}{-x+2}$

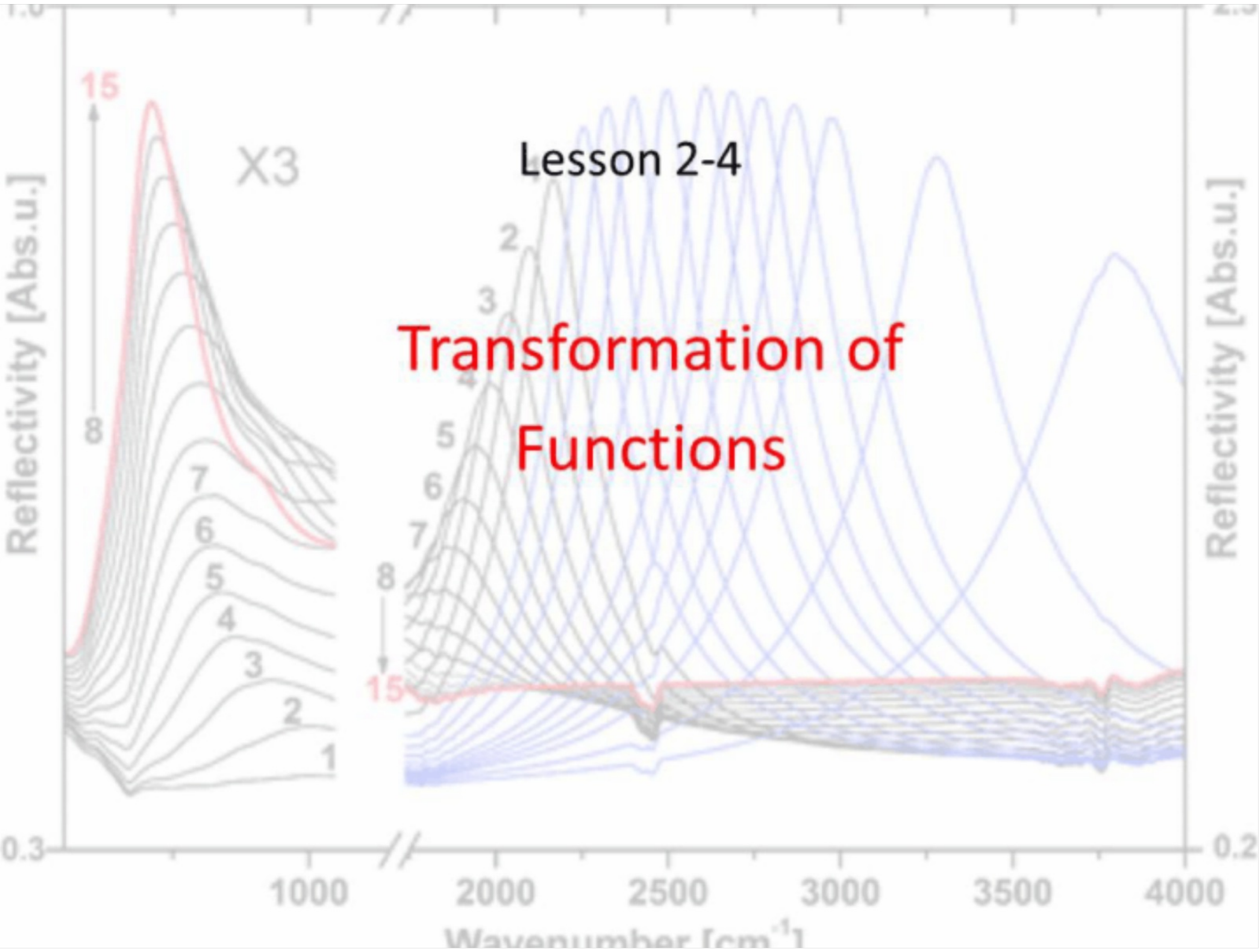
$\neq -\frac{1}{x+2}$

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

$= -\frac{1}{x-2}$

Lesson 2-4

Transformation of Functions



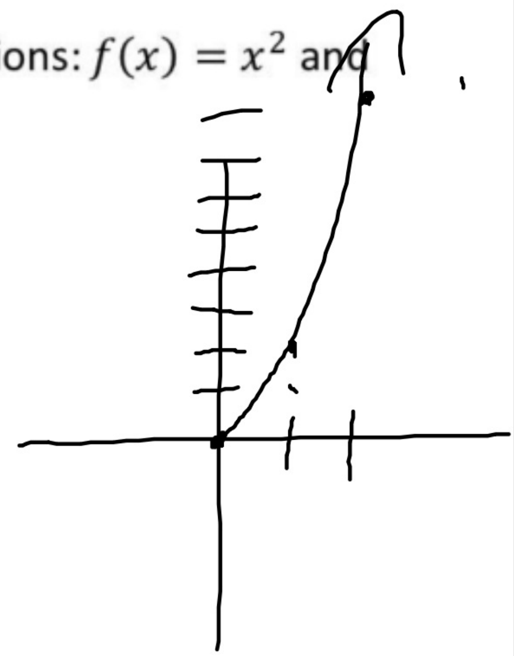
Objective

Students will…

- Be able to apply the properties of stretch and compression in graphing various functions.
- Be able to determine the scale factor of the stretch or compression.

Transformation of Functions

Let’s go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = 2x^2$



Transformation of Functions

Let's go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = \frac{1}{2}x^2$

Transformation: Stretch and Compression

As observed, the transformation that took place was a vertical **stretch or a compression** by a certain **scale factor**. This can be generalized by the following:

For $y = cf(x)$

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

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

$)=2x^2$

$=\frac{1}{2}x^2$

Transformation of Functions

Now let's go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = (2x)^2$

Transformation of Functions

Now let's go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = \left(\frac{1}{2}x\right)^2$

Transformation: Stretch and Compression

As observed, the transformation that took place was a horizontal **stretch or a compression** by a certain **scale factor**. This can be generalized by the following:

For $y = f(cx)$

If $c > 1$, compress 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 $\frac{1}{c}$

Note the **opposite relationship** of the scale factor between vertical and horizontal stretch/compression.

Examples

Determine whether the function has a vertical or a horizontal stretch/compression, and determine its scale factor.

a. $f(x) = 3(x^2)$

Vertical stretch. by a factor of 3.

b. $f(x) = \left(\frac{1}{2}x\right)^3$

horizontal stretch. by a factor of 2.

c. $h(x) = \frac{3}{4}(x-1)^{19}$

Vertical compression by factor of 3/4

d. $p(x) = \sqrt{3x}$

horizontal Compression by factor 1/3

e. $f(x) = \frac{5}{4}|x|$

Vertical stretch by factor of 5/4

f. $q(x) = \frac{8}{5}\sqrt[6]{x-1}$

Vertical stretch by factor of 8/5

g. $u(x) = \frac{10}{11}(x-990)^5$

Vertical compression by factor of 10/11.

h. $t(x) = 3\sqrt{\frac{7}{6}(x+5)}$

Vertical stretch by factor of 3

&

Horizontal compression by factor of 6/7.

Examples

For the function given function f, write the equation for the final transformed graph, based on the description of the transformation done.

$f(x) = \sqrt[3]{x}$; shift 3 units to the left, stretch vertically by a factor of 5, and reflect in the x-axis.

outside

Vertical.

y-axis.

$f'(x) = -5\sqrt[3]{x+3}$

$f'(x) = 5\sqrt[3]{-(x+3)}$

$-5(x-1)^2+3$

Examples

Explain how the graph of g is obtained from the graph of f.

$f(x) = |x|$, $g(x) = 3|x| + 1$

Vert. stretch by factor of 3, up 1.

$f(x) = |x|$, $g(x) = -|x + 1|$

Vert. reflection, (along x-axis) left 1.

Homework 9/12

Transformation WKSHT