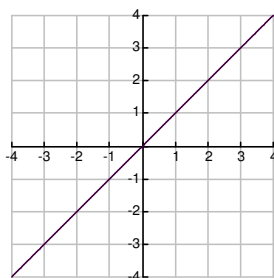


Identity Function – Handout 1

Certain functions that are used repeatedly in mathematics are called special functions. These functions come from basic functions called parent functions. The parent function gives us a general idea of what the graph looks like. If you are familiar with the parent functions, it makes graphing the families of that function much easier.

The Identity Function

One such parent function is the **identity function**. The equation is $y = x$ and its graph is a line. It passes through the origin and its slope is 1.



From this parent comes a family of graphs called **linear functions**. A linear function's general equation is $y = m(x - h) + k$. (This can be written as $y = mx + b$ when simplified.)

VERTICAL STRETCHING TRANSLATIONS

I. Graph:

$y = x$	$y = 1(x - 0) - 0$
$y = 3x$	$y = 3(x - 0) - 0$
$y = 8x$	$y = 8(x - 0) - 0$
$y = \frac{1}{3}x$	$y = \frac{1}{3}(x - 0) - 0$
$y = \frac{2}{5}x$	$y = \frac{2}{5}(x - 0) - 0$

What conclusion can you make about the effect of the **value of m** on the graph of the parent function $y = x$?

TRANSLATIONS REFLECTING ALONG THE X-AXIS

II. Graph:

$y = x$	$y = 1(x - 0) - 0$
$y = -3x$	$y = -3(x - 0) - 0$
$y = -8x$	$y = -8(x - 0) - 0$
$y = -\frac{1}{3}x$	$y = -\frac{1}{3}(x - 0) - 0$
$y = -\frac{2}{5}x$	$y = -\frac{2}{5}(x - 0) - 0$

What conclusion can you make about the effect of the **sign of m** on the graph of the parent function $y = x$?

VERTICAL SHIFT TRANSLATIONS

III. Graph:

$y = x$	$y = 1(x - 0) - 0$
$y = x + 2$	$y = 1(x - 0) + 2$
$y = x + 5$	$y = 1(x - 0) + 5$
$y = x - 3$	$y = 1(x - 0) - 3$
$y = x - 8$	$y = 1(x - 0) - 8$

What conclusion can you make about the effect of **k** on the graph of the parent function $y = x$?

PHASE (HORIZONTAL) TRANSLATIONS

IV. Graph:

$y = x$	$y = 1(x - 0) - 0$
	$y = 1(x - 2) + 0$
	$y = 1(x - 6) + 0$
	$y = 1(x + 3) + 0$
	$y = 1(x + 7) + 0$

What conclusion can you make about the effect of **h** on the graph of the parent function $y = x$?

SUMMARY

$$y = m(x - h) + k$$

- 1) When $|m| > 1$, the line becomes **steeper** (a stretch). When $|m| < 1$, the line becomes **flatter** (a compression). When $|m| = 1$ there is no change in the **steepness** or **flatness** of the line.
- 2) When $m > 0$ (i.e. positive) the line slants **up** and to the **right** and is **not reflected across the x-axis**.
When $m < 0$ (i.e. negative) the line slants **up** and to the **left** and is **reflected across the x-axis**.
- 3) The effect of **k** on the graph of the parent function $y = x$ is called the **vertical shift**.
If $k > 0$ (i.e. positive), the graph shifts **up k units**.
If $k < 0$ (i.e. negative), the graph shifts **down k units**.
- 4) The effect of **h** on the graph of the parent function $y = x$ is called the **phase shift** or **horizontal shift**.
When $h > 0$ (i.e. $(x - h)$) the graph shifts to the **right h units**.
When $h < 0$ (i.e. $(x + h)$) the graph shifts to the **left h units**.

You can see that if you write the equation of a line in **point-slope form**, it is easy to make **4 conclusions** about the function in relation to the graph of its parent function $y = x$.

Directions: Based on the discovery lesson, answer the following and graph.

I. For each problem:

- | | |
|--|-----------------------------|
| a) Name the function | e) State the phase shift |
| b) Name the parent function | f) State the vertical shift |
| c) State the vertical stretch or compression | g) Starting Point |
| d) Reflection? | h) Graph |

1. $y = -4$

- a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____

2. $y = -3x + 1$

- a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____

3. $y = \frac{1}{3}x + 1$

- a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____

4. $y = -(x + 3) - 4$

- a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____

5. $y = 5x$

- a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____

6. $y = \frac{2}{3}(x - 2) + 3$

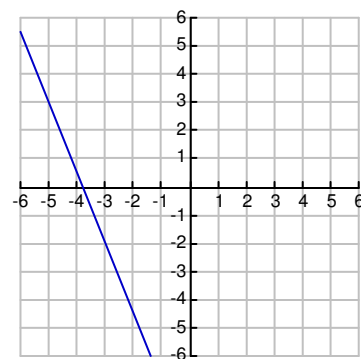
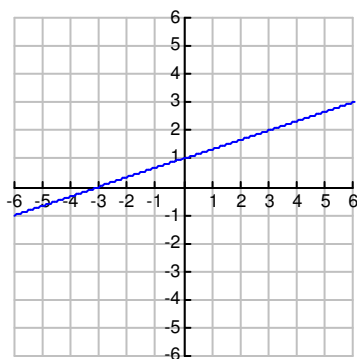
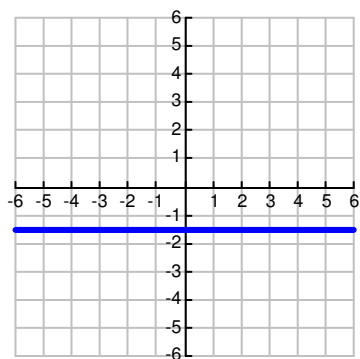
- a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____

7. $y = \pi$
- a) _____
- b) _____
- c) _____
- d) _____
- e) _____
- f) _____
- g) _____
8. $y = -\frac{1}{4}(x-0)-5$
- a) _____
- b) _____
- c) _____
- d) _____
- e) _____
- f) _____
- g) _____
9. $y = 0$
- a) _____
- b) _____
- c) _____
- d) _____
- e) _____
- f) _____
- g) _____

II. For each graph :

- a) Name the function
- b) Name the parent function
- c) Write the equation from the graph in the form $y = m(x-h) + k$

1. a) _____
- b) _____
- c) _____
2. a) _____
- b) _____
- c) _____
3. a) _____
- b) _____
- c) _____



4. a) _____
b) _____
c) _____

5. a) _____
b) _____
c) _____

6. a) _____
b) _____
c) _____

