Date:
Unit 1: Intro to Functions

## INVESTIGATION: Type $y=a f(x)$

1. On the same set of axes, sketch the graphs of $f(x)=\sqrt{x}, y=2 f(x)$ and $y=\frac{1}{2} f(x)$.

| $x$ | $\sqrt{x}$ | $2 \sqrt{x}$ | $\frac{1}{2} \sqrt{x}$ |
| :---: | :---: | :---: | :---: |
| 1 | $\sqrt{0}=0$ | $2 \sqrt{0}$ <br> $=0$ | $0.5 \sqrt{0}$ <br> $=0$ |
| 4 | $\sqrt{4}=2$ | $2 \sqrt{1}$ <br> $=2$ | $0.5 \sqrt{1}$ <br> $=0.5$ |
| 9 | $\sqrt{9}=3$ | $0.5 \sqrt{4}$ <br> $=1$ <br> $=6$ |  |
| $0.5 \sqrt{9}$ |  |  |  |
| $=1.5$ |  |  |  |



If $y=f(x)$ is transformed to $y=a f(x)$, where $a$ is a number, describe the transformation:
a) If $|a|>1$, then the parent function is stretcheolvertically by a factor of "a|".
b) If $0<|a|<1$, then it is compressed_vertically _bafo |a|

Any point $(x, y)$ under this transformation becomes ( $X, Q Y$ )

* MAPPING NOTATION

INVESTIGATION: Type $\boldsymbol{y}=\boldsymbol{f}(\boldsymbol{k x})$

1. On the same set of axes, sketch the graphs of $f(x)=\sqrt{x}, y=f(2 x)$ and $y=f\left(\frac{1}{2} x\right)$.
Q)

| $x$ | $\sqrt{2 x}$ <br> 0$\sqrt{20}$ <br> $=0$ |
| :---: | :---: |
| 0.5 | $\sqrt{2 \times 0.5}$ <br> $=1$ |
| 2 | $\sqrt{22}$ <br> $=2$ |
| 4.5 | $\sqrt{2 \times 4} .5$ <br> $=3$ |

b)

| $x$ | $\sqrt{\frac{1}{2} x}$ |
| :---: | :---: |
| 0 | $\sqrt{0.5 \times 0}$ <br> $=0$ |
| 2 | 1 |
| 8 | 2 |
| 18 | 3 |


4. If $y=f(x)$ is transformed to $y=f(k x)$, where $k$ is a number, describe the transformation:

$\square$

a) If $|\mathrm{k}|>1$, then the parent function is Compressedhorizontally by factor of " $\frac{1}{|k|}$ ".
b) If $0<|\mathrm{k}|<1$, then it is stretched horizontally_bafo $/ /|k|$

Any point ( $x, y$ ) under this transformation becomes $\left(\frac{x}{k}, y\right)$.

11 Academic
Day 7: Stretches, Compressions \& Reflections

## INVESTIGATION: Type $\boldsymbol{y}=-\boldsymbol{f}(\boldsymbol{x})$

1. On the same set of axes, sketch the graphs of $f(x)$ and $-f(x)$.
a. $f(x)=|x|$
b. $f(x)=\sqrt{x}$


2. If $y=f(x)$ is transformed to $y=-f(x)$, where $a$ is a negative number, describe the transformation:

I noticed that the graph is reflected about the " $\underline{\text { " }}$ axis.
Any point ( $x, y$ ) under this transformation becomes ( $x,-y$ ).

INVESTIGATION: Type $\boldsymbol{y}=\boldsymbol{f}(-\boldsymbol{x})$
3. On the same set of axes, sketch the graphs of $f(x)$ and $f(-x)$.
horizontally reflected

4. If $y=f(x)$ is transformed to $y=f(k x)$, describe the transformation:
a) If $\mathrm{k}=-1$, then the graph is reflected about the " $y$ " axis.

Any point ( $x, y$ ) under this transformation becomes $(-x, y)$. if it's vertical transformation only "y" change in horizontal il il "x" chonpes

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Day 7: Stretches, Compressions \& Reflections

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$\frac{\text { Vertical comp }}{(x, y) \rightarrow\left(x, \frac{1}{2} y\right)}$
$(-4,0) \rightarrow(-4,0.5 \cdot 0)=(-4,0)$
$(-2,2) \rightarrow(-2,0.5 \cdot 2)=(-2,1)$

(c) $g(x)=\frac{1}{2} f(x)$
(a) $f(x)$

(b) $g(x)=2 f(x) \quad(x, y) \rightarrow(x,-a y)$

(d) $g(x)=-3 f(x)$

$$
\begin{aligned}
\text { if } k & =\frac{1}{2} \\
\text { then } \frac{1}{k} & =2
\end{aligned}
$$

(a) $f(x)$
$(x, y) \rightarrow(2 x, y)$

$$
(-4,0) \rightarrow(2 \cdot-4,0)=(-8,0)
$$

$$
(-2,2) \rightarrow(2 \cdot-2,2)=(-4,2)
$$

$$
(2,2) \rightarrow(2 \cdot 2,2)=(4,2)
$$

$$
(4,0) \rightarrow(2 \cdot 4,0)=(8,0)
$$

Horizontal Stretches of $f(x) \quad(x, y) \rightarrow\left(\frac{x}{k}, y\right) \quad f(2 x)$


(c) $g(x)=f\left(\frac{1}{2} x\right)$

(b) $g(x)=f(2 x)$

(d) $g(x)=-f(2 x)$

Let $f(x)=x^{2}$.
What do the following transformations represent in terms of stretches, reflections, and shifts?
a. $2 f(x)$
d. $-f(2 x)$
b. $3 f(x)$
e. $f\left(\frac{1}{3} x\right)+4$
c. $\frac{1}{2} f(x)$
f. $-2 f(x-1)$

Verify your answers using DESMOS or graphing calculator.
a). if $f(x)=x^{2}$
then $2 f(x)=2 x^{2}$ it's a vertical stretch by a factor of 2
d) - Vertical reflection pout "x" axis

- horizontal compresilon bate $1 / 2$
(b) $3 f(x)$
vertical stretch bafo 3
c) $\frac{1}{2} f(x)$ vertical compression bolo $1 / 2$
e) -horizontal stretch bafo 3
- shift 4 units up.
f) $-2 f(x-1)$
vertical reflection about the "x" axis vertical stretch bolo 2 whit I unit right

