# 1 Intro to Functions

## 1.1 Transformations

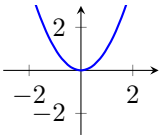
$$y = af(k(x - d)) + c$$

Where:

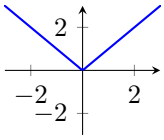
- a and c affect the y-coordinate
- k and d affect the x-coordinate

### Functions

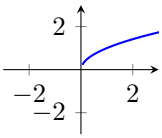
Quadratic Function
$y = x^2$
$y = a(k(x - d))^2 + c$



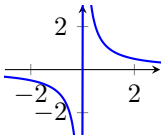

Absolute Value Function
$y = |x|$
$y = a|k(x - d)| + c$



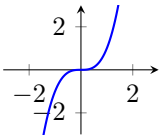

Root Function
$y = \sqrt{x}$
$y = a\sqrt{k(x - d)} + c$



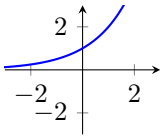

Reciprocal Function
$y = \frac{1}{x}$
$y = \frac{a}{k(x-d)} + c$




Cubic Function
$y = x^3$
$y = a(k(x - d))^3 + c$




Exponential Function
$y = 2^x$
$y = a2^{k(x-d)} + c$



Effects of Letters

a:

`0 < |a| < 1`

Vertical compression by a factor of $|a|$
Multiply y values by $|a|$

`|a| > 1`

Vertical stretch by a factor of $|a|$
Multiply y values by $|a|$

`a < 0`

Reflection over the x-axis
Multiply y values by -1

k:

`0 < |k| < 1`

Horizontal stretch by a factor of $\frac{1}{|k|}$
Multiply x values by $\frac{1}{|k|}$

`|k| > 1`

Horizontal compression by $\frac{1}{|k|}$
Multiply x values by $\frac{1}{|k|}$

`k<0`

Reflection over the y-axis
Multiply x values by -1

c:

`c > 0`

Shift up c units
Add c to y values

`c < 0`

Shift down c units
Add c to y values

d:

`d > 0`

Shift right d units
Add d to x values

`d < 0`

Shift left d units
Add d to x values

Notes:
- k must be factored out in order to determine the value of d
- The order to complete transformations is:

```
1) Stretch/Compress
2) Reflect
3) Shift
```