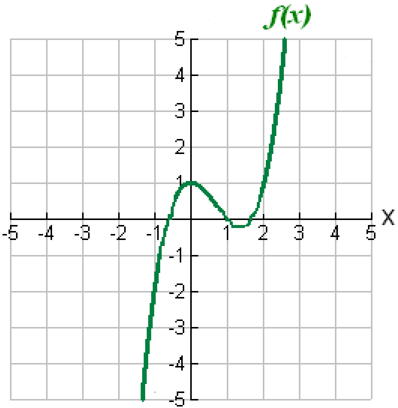
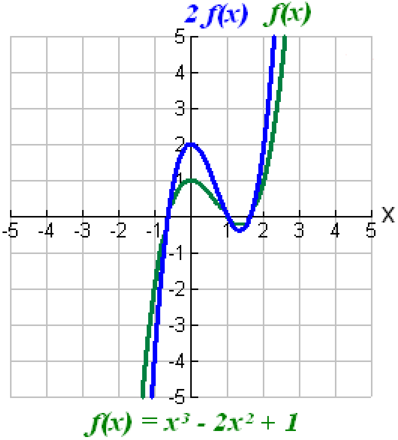
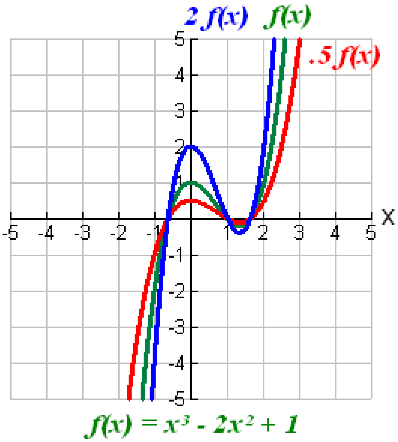
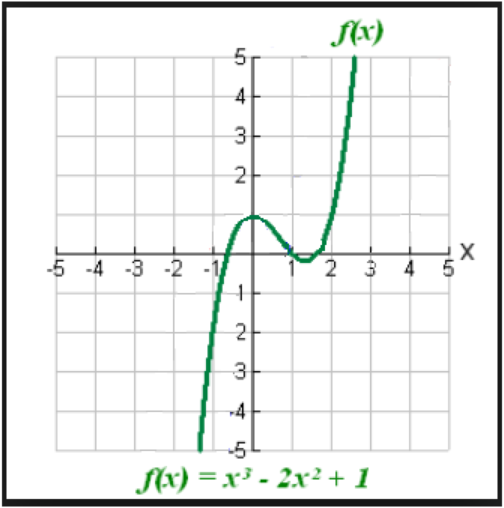
Graph Transformations

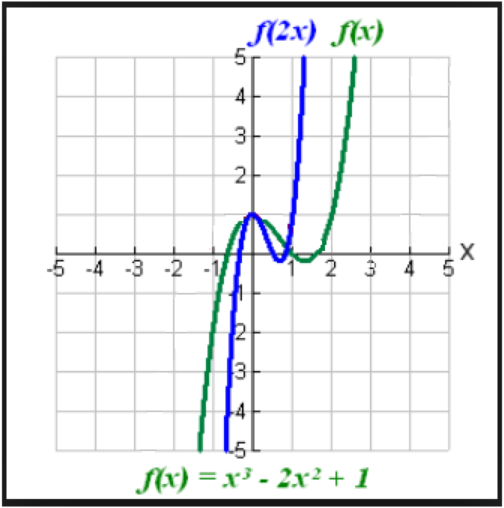


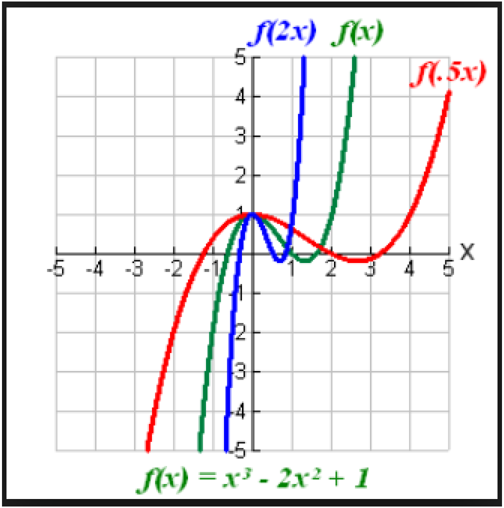
$f(x) = x^3 - 2x^2 + 1$


2 f(x)
f(x)
5
4
3
2
1
-5
-4
-3
-2
-1
1
2
3
4
5
X
-1
-2
-3
-4
-5
f(x) = x³ - 2x² + 1

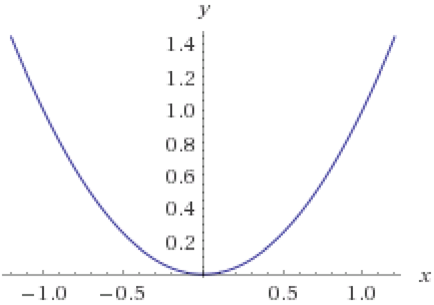

2 f(x)
f(x)
.5 f(x)
X
5
4
3
2
1
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 1 2 3 4 5
f(x) = x³ - 2x² + 1


f(x)
5
4
3
2
1
-1
-2
-3
-4
-5
-5 -4 -3 -2 -1 1 2 3 4 5
X
f(x) = x³ - 2x² + 1

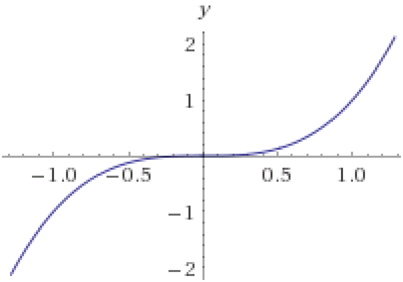

f(2x)
f(x)
5
4
3
2
-1
-2
-3
-4
-5
-5
-4
-3
-2
-1
1
2
3
4
5
X
f(x) = x³ - 2x² + 1


f(2x)
f(x)
f(.5x)
X
5
4
3
2
1
-1
-2
-3
-4
-5
-5
-4
-3
-2
-1
1
2
3
4
5
f(x) = x³ - 2x² + 1

$a = n$ where n is a positive integer

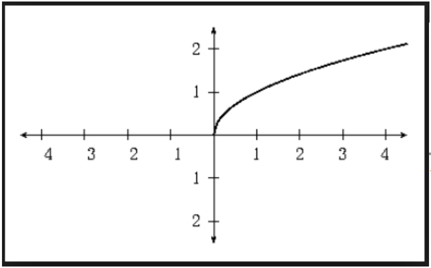


x^n where n is even

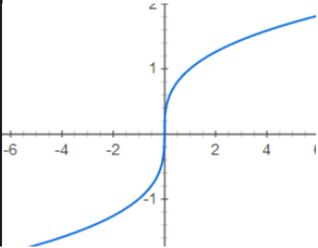


x^n where n is odd

$a = \frac{1}{n}$ where n is a positive integer

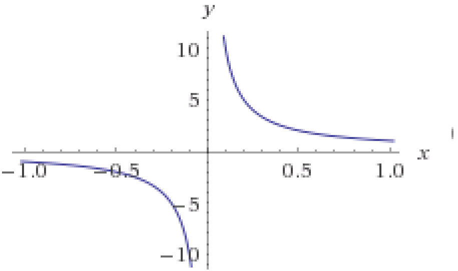


$\sqrt[n]{x}$ where n is even



$\sqrt[n]{x}$ where n is odd

$a = -1$



$$\frac{1}{x}$$

Practice Problems!

1. Write $h(x) = \frac{1}{x^2+6x+9}$ as the composition of two nonidentity functions.
2. Write $h(x) = \frac{1}{x^2+6x+9}$ as the composition of three nonidentity functions.
3. Write $k(x) = -4x^2 - 12x - 4$ as the composition of two nonidentity functions.
4. Write $q(x) = -2x^2 + 13$ as the composition of two nonidentity functions.

Solutions

1. $h(x) = (f \circ g)(x)$ where $f(x) = \frac{1}{x}$ and $g(x) = x^2 + 6x + 9$.
2. $h(x) = (f \circ a \circ b)(x)$ where $f(x) = \frac{1}{x}$, $a(x) = x^2$, and $b(x) = x + 3$.
3. There are a couple of answers here. You could do $k(x) = (f \circ g)(x)$ where $f(x) = -4x$ and $g(x) = x^2 + 3x + 1$. You could also do $k(x) = (a \circ b)(x)$ where $a(x) = -x^2 + 5$ and $b(x) = 2x + 3$ (this one is pretty hard to find!).
4. $q(x) = (b \circ a)(x)$ where $b(x) = 2x + 3$ and $a(x) = -x^2 + 5$. A way to think about this: you can't factor a 2 directly out of $-2x^2 + 13$, so can you rewrite the formula a little bit? This will give you $-2x^2 + 10 + 3$. Now you can factor a 2 out of part of it: $2(-x^2 + 5) + 3$.