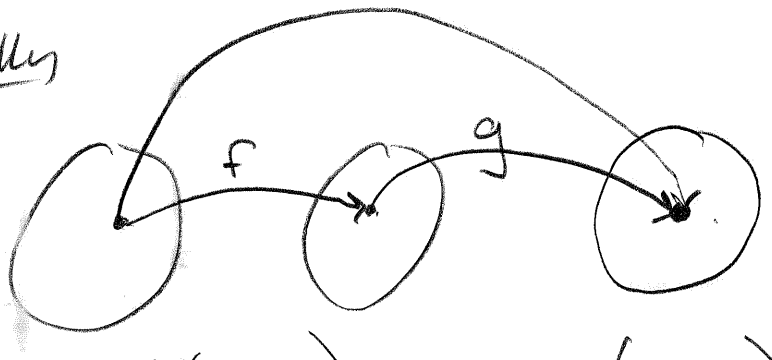
Math 1010 9/24/12 - Sec 5.3 (cont.)
Sec 5.4

Sec 5.3 Cont

Composite Functions

a composite function takes the result of one function and runs it through the second function

Pictorally



defn: $\rightarrow (g \circ f)(x) = g(f(x))$

Read "g of f"

g composed with f

The domain of $g \circ f$ is such that x for all x in the domain of f such that f(x) is in the domain of g

Ex: $f(x) = x^2 + 2$ and $g(x) = x - 3$

find $(g \circ f)(x) = g(f(x))$

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

$= x^2 + 2 - 3$

$= x^2 - 1$

Domain: $(-\infty, \infty)$

$(g \circ f)(6) = g(f(6)) = (6)^2 - 1$

$= g(6^2 + 2)$ $\quad 36 - 1$

$= g(38)$ $\quad 35$

$= 38 - 3$

$= 35$

Ex: $g(x) = 4 - 2x$ $\quad f(x) = 3x + 5$

$(g \circ f)(x) = g(f(x))$

$4 - 2(3x + 5)$

$4 - 6x - 10$

$-6x - 6$

$(f \circ g)(x) = f(g(x))$

$= 3(4 - 2x) + 5$

$= 12 - 6x + 5$

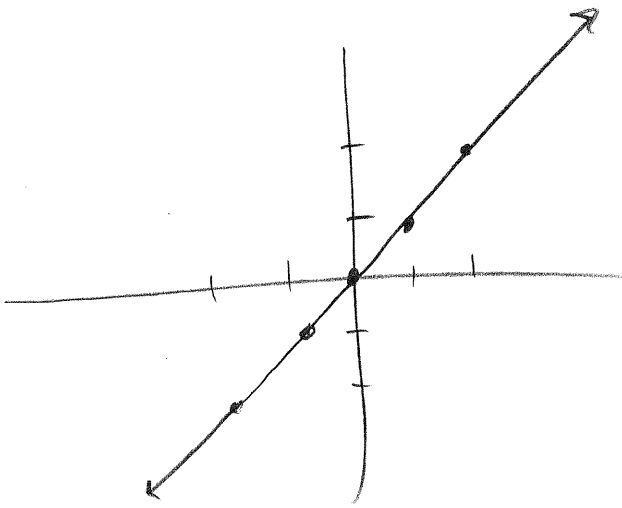
$= -6x + 17$

Graphing Basic Polynomials

Identity function

$f(x) = x$

x	y
-2	-2
-1	-1
0	0
1	1
2	2



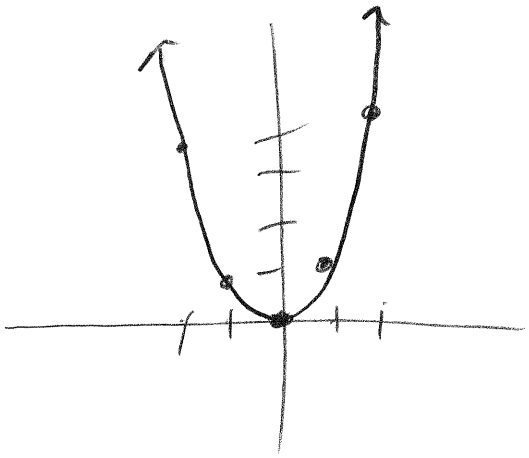
Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

Squaring Function

$f(x) = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4



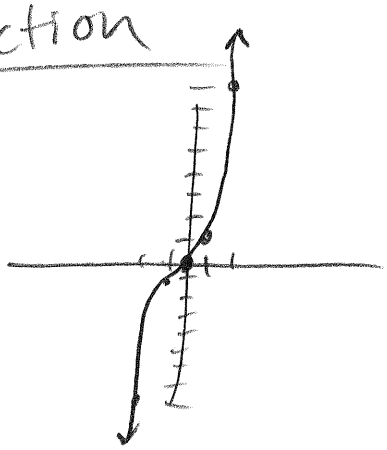
Domain: $(-\infty, \infty)$

Range: $[0, \infty)$

Cubing Function

$f(x) = x^3$

x	y
-2	-8
-1	-1
0	0
1	1
2	8

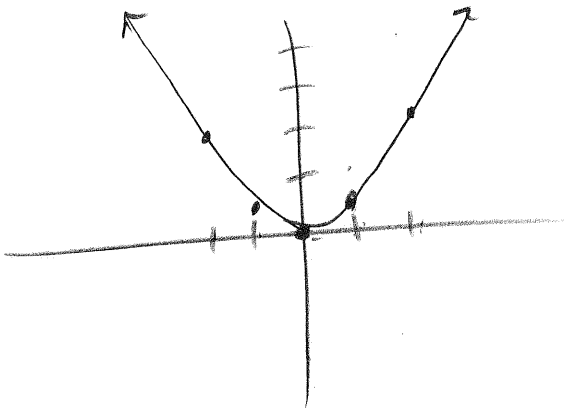


Domain: $(-\infty, \infty)$

Range: $(-\infty, \infty)$

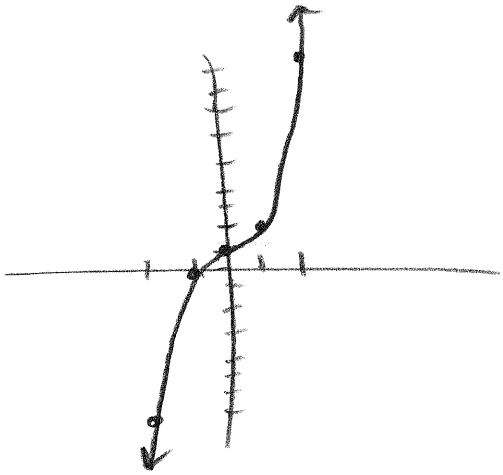
Ex: $g(x) = \frac{1}{2}x^2$

x	y
-2	$\frac{1}{2}\cdot 4 = 2$
-1	$\frac{1}{2}\cdot 1 = \frac{1}{2}$
0	$\frac{1}{2}\cdot 0 = 0$
1	$\frac{1}{2}\cdot 1 = \frac{1}{2}$
2	$\frac{1}{2}\cdot 4 = 2$



#59 $f(x) = x^3 + 1$

x	y
-2	$-8+1 = -7$
-1	$-1+1 = 0$
0	$0+1 = 1$
1	$1+1 = 2$
2	$8+1 = 9$



Sec 5.4 Multiplying Polynomials

Monomial * Polynomial

Ex: $5x^2(-4x^2 + 3x + -2)$

$5x^2(-4x^2) + 5x^2(3x) + 5x^2(-2)$

$(5)(-4)x^2 \cdot x^2 + (5)(3)x^2 \cdot x + (5)(-2)x^2$

$-20x^4 + 15x^3 + -10x^2$

$-20x^4 + 15x^3 - 10x^2$

Ex: $(4x+2)(6x^2+3x+5)$

$(4x+2)6x^2 + (4x+2)3x + (4x+2)5$

$4x(6x^2) + 2(6x^2) + 4x(3x) + 2(3x) + 4x(5) + 2(5)$

$24x^3 + 12x^2 + 12x^2 + 6x + 20x + 10$

$24x^3 + 24x^2 + 26x + 10$

$$\begin{array}{r} 6x^2 + 3x + 5 \\ 4x + 2 \\ \hline 12x^2 + 6x + 10 \\ 24x^3 + 12x^2 + 20x \\ \hline 24x^3 + 24x^2 + 26x + 10 \end{array}$$

Ex: Binomial times Binomial

Ex: $(2x+5)(3x-4)$ FOIL!

$2x(3x) + 2x(-4) + 5(3x) + 5(-4)$

$6x^2 - 8x + 15x - 20 = 6x^2 + 7x - 20$

#21 $[4x^3(x-3)](x+2)$

$(4x^4 - 12x^3)(x+2)$

$4x^5 + 8x^4 - 12x^4 - 24x^3$

$4x^5 - 4x^4 - 24x^3$

$(4 \cdot 2) \cdot 5$

$8 \cdot 5$

40

or

$4(2 \cdot 5)$

$4 \cdot 10$

40

Special Products

Product of a sum and difference

$(x+y)(x-y) = x^2 - \cancel{xy + xy} - y^2$

$= x^2 - y^2$

Ex: $(p+7)(p-7) = p^2 - 7^2$

$= p^2 - 49$

Square of a Binomial

$(x+y)^2 = (x+y)(x+y)$

$= x^2 + xy + xy + y^2$

$= x^2 + 2xy + y^2$

$$(x+3)^2 = x^2 + 2x(3) + 3^2$$

x y

$$x^2 + 6x + 9$$

Defn:

If $f(x)$ and $g(x)$ define functions, then

$$(fg)(x) = f(x) \cdot g(x)$$

Let $f(x) = x - 7$, $g(x) = 4x + 5$

$$(fg)(x) = f(x) \cdot g(x)$$

$$= (x - 7)(4x + 5)$$

$$= 4x^2 - 23x - 35$$