

**EVALUATING POLYNOMIAL FUNCTIONS**

One way to evaluate a polynomial function is to use direct substitution. For instance,

$f(3) = 2x^4 - 8x^2 + 5x - 7$  can be evaluated as follows...

$$f(3) = 3(3)^4 - 8(3)^2 + 5(3) - 7$$

$$f(3) = 162 - 72 + 15 - 7$$

$$f(3) = 98$$

Another way to evaluate a polynomial function is to use **Synthetic Substitution**.

Use synthetic substitution to evaluate  $f(x) = 2x^4 - 8x^2 + 5x - 7$  when  $x = 3$ .

Solution: (Write the value of 'x' and the coefficients of f(x) as shown. Bring down the leading coefficient. Multiply by 3 and write the result in the next column. Add the numbers in the column and write the sum below the line. Continue to multiply and add.)

$$\begin{array}{r|rrrrr} 3 & 2 & 0 & -8 & 5 & -7 \\ & \downarrow & 6 & 18 & 30 & 105 \\ \hline & 2 & 6 & 10 & 35 & 98 \end{array}$$

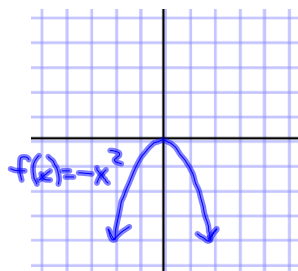
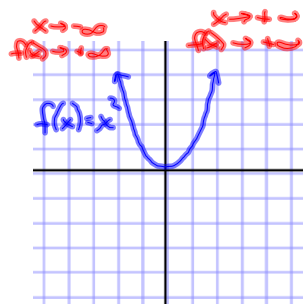
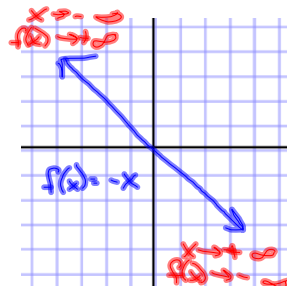
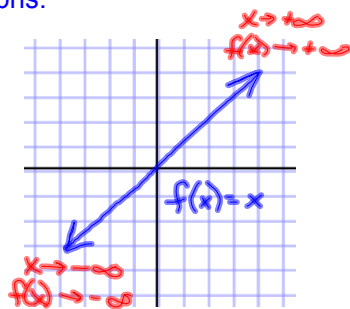
Use synthetic substitution to evaluate  $f(x) = 3x^5 - x^4 - 5x - 10$  when  $x = -2$ .

$$\begin{array}{r|rrrrrr} -2 & 3 & -1 & 0 & 0 & -5 & -10 \\ & \downarrow & -6 & 14 & -28 & 56 & -102 \\ \hline & 3 & -7 & 14 & -28 & 51 & -112 \end{array}$$

$f(-2) = -112$

**Graphing Polynomial Functions**

The **end behavior** of a polynomial function's graph is the behavior of the graph as 'x' approaches positive infinity ( $+\infty$ ) or negative infinity ( $-\infty$ ). The expression  $x \Rightarrow +\infty$  is read as "x approaches positive infinity." Write the end behavior of these graphs.



## End Behavior For Polynomial Functions

The graph of  $f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$  has this end behavior:

	Left	Right
	$\underline{x} \Rightarrow$ as $f(\underline{x}) \Rightarrow$	$\underline{x} \Rightarrow$ as $f(\underline{x}) \Rightarrow$
For $a_n > 0$ and $n$ even,	-∞    +∞	+∞    +∞
For $a_n > 0$ and $n$ odd,	-∞    -∞	+∞    +∞
For $a_n < 0$ and $n$ even,	-∞    -∞	+∞    -∞
For $a_n < 0$ and $n$ odd,	-∞    +∞	+∞    -∞

### Graphing Polynomial Functions

**Graph**  $f(x) = x^3 + x^2 - 4x - 1$

To graph the function, make a table of values and plot the corresponding points. Connect the points with a smooth curve and check the end behavior.

x	-3	-2	-1	0	1	2	3
f(x)	-7	3	3	-1	-3	3	23

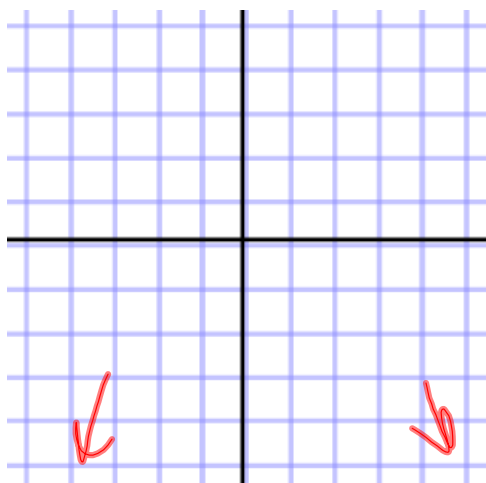


## Graphing Polynomial Functions

Graph  $f(x) = -x^4 - 2x^3 + 2x^2 + 4x$ 

To graph the function, make a table of values and plot the corresponding points. Connect the points with a smooth curve and check the end behavior.

x							
f(x)							



Assignment:

p. 334

# 38-46 even,  
50-60 even,  
68, 72