

- 3.1 – Quadratic Functions and Models
- 3.2 – Polynomial Functions and their Graphs
- 3.3 – Dividing Polynomials

This week's assignment is very similar to Writing Project #3 from previous semesters, except its emphasis is on the first 3/7 of it (Sections 3.4 – 3.7 on Week 9 Written Assignment). I suggest the following links:

1. Writing Project #3:
  - a. [Notes](#)
  - b. [Video](#)
  - c. An Old Writing Project #3
    - i. [Notes](#)
    - ii. [Video](#)

There's extra material there that isn't covered in this assignment.

1. Complete the square to write  $f$  in Standard Form and sketch the graph of  $f$ . Your graph should include the vertex and all  $x$ - and  $y$ -intercepts. Finally, state the domain and range of  $f$ .
  - a. (5 pts)  $f(x) = x^2 - 4x - 21$ .
  - b. (5 pts)  $f(x) = -3x^2 - 42x - 72$ .
2. Let  $f(x) = x^6 + 11x^5 + 19x^4 - 115x^3 - 200x^2 + 500x$  and  $p(x) = x - 2$ 
  - a. (5 pts) Use synthetic division to find the quotient  $q(x)$  and remainder  $r(x)$  when  $f$  is divided by  $p$ . Use your work to write  $f(x)$  in the form  $f(x) = p(x)q(x) + r(x)$ .
  - b. (**Bonus 5 pts**) Sneak preview of 3.6: Your work in part a also allows you to write the quotient  $\frac{f(x)}{p(x)} = q(x) + \frac{r(x)}{p(x)}$ . Now, as  $|x| \rightarrow \infty$ ,  $\frac{r(x)}{p(x)} \rightarrow 0$ . What does this say about what  $f$  looks like as  $x \rightarrow \pm\infty$ ?
  - c. (5 pts) Based on your work in part a, what is  $f(2)$ ?
  - d. (5 pts) According to the book, the *end behavior* of  $f$  is:  
 $y \rightarrow \infty$  as  $x \rightarrow -\infty$  and  $y \rightarrow \infty$  as  $x \rightarrow \infty$ , because it's controlled by  $y = x^6$ . That's a lot of words. Provide a simple graphic that sums this information up, visually.
  - e. (5 pts) Suppose I told you that  $f$  factors into  $f(x) = x(x-2)^2(x+5)^3$  (It does!). Provide a rough sketch of the graph of  $f$ , based on the  $x$ - and  $y$ -intercepts, the end behavior of  $f$ , and the multiplicity of the zeros of  $f$ . Provide a SIGN PATTERN for  $f$  to help you in this.

- f. (5 pts) Let  $D(x) = x^2 - 3x - 15$ . Use long division to find the quotient  $Q(x)$  and remainder  $R(x)$ , when  $f$  is divided by  $D$ .
- g. (5 pts) Find all real zeros of  $f$  and state their respective multiplicities.
- h. **(Bonus 5 pts)** Solve the inequality  $f(x) < 0$
- i. **(Bonus 5 pts)** What is the domain of  $g(x) = \sqrt{f(x)}$ ?