Mth 30, Homework 5 on sections 3.3, 3.4, 3.5

Due by Wed, Mar 4.

Please use lots of space and explain your answers, showing clearly any work you had to do. Each question is worth 3 points.

Section 3.3 Power Functions and Polynomial Functions

(1) For the power function $f(x) = -2x^3$,

- **(a)** Compute $f(10)$ and $f(100)$, showing the behavior going right.
- **(b)** Compute $f(-10)$ and $f(-100)$, showing the behavior going left.

(2) For the same $f(x) = -2x^3$, fill in the blanks describing its end behavior:

- **(a)** As $x \to \infty$, $f(x) \to$ ___.
- **(b)** As $x \to -\infty$, $f(x) \to$ ___.

(Hint: your answers here should be ∞ or $-\infty$ and should match the previous question.)

(3) For the polynomial $3x^6 - 4x^4 + 7x^2 + x - 13$ find:

- **(a)** its degree,
- **(b)** its leading term,
- **(c)** its leading coefficient.

(4) Give the end behavior of $g(x) = 12x^4 - 4x + 7$ by drawing the arrows that show the direction of the graph going left and right.

Section 3.4 Graphs of Polynomial Functions

(5) Find the x and y intercepts and end behavior of $f(x) = -2x(x-2)(x+5)$ and use this information to carefully sketch its graph. Make sure to label and number the axes.

(Hint: there are three x intercepts.)

(6) Find the x intercepts of $h(x) = 2x^4 - 8x^3 + 6x^2$

(Hint: to factor $h(x)$ take out the gcd first)

(7) Find the zeros of $f(x) = x^3 + 2x^2 - 9x - 18$

(Hint: The zeros are just another name for the x intercepts. Factor by grouping.)

(8) For $g(x) = (2x+1)^3(9x^2-6x+1)$ use factoring to explain why its zeros are just $-1/2$ and $1/3$ and give their multiplicities.

(9) Sketch the graph of $h(x) = (x+3)^2(x-2)$ after finding its end behavior, intercepts and multiplicities of zeros. Make sure to label and number the axes.

(Remember that if the multiplicity is even then the graph does not cross the x-axis there.)

Section 3.5 Dividing Polynomials

(10) Use long division (not synthetic division) to divide $2x^3 - 5x^2 + 5x - 3$ by $2x + 1$. Identify the quotient and the remainder.

(Hint: You should get a remainder of -7.)

(11) Divide $4x^3 + 10x^2 - 5x - 6$ by $x + 3$. Give the quotient and the remainder.

(Synthetic division is recommended - you should have $k = -3$.)

(12) Divide $f(x) = 3x^4 - 6x^3 - 5x + 10$ by $x - 2$. Is $x - 2$ a factor of $f(x)$?

(If using synthetic division, add a 0 for the missing power of x.)

(13) Let $g(x) = 2x^3 - 9x^2 - 3x + 8$. Evaluate $g(5)$ in two ways: first by substituting 5 into the formula, and secondly using synthetic division (with $k = 5$) to get the answer as a remainder. Make sure you get the same answer both ways!

(This is using the Remainder Theorem which says that if you divide $g(x)$ by $x - k$ then the remainder is $g(k)$.)

(14) Factor the polynomial $2x^3 + 7x^2 - 46x + 21$ completely by using that one factor is $x - 3$.

(Hint: Use synthetic division and then factor the quotient.)

If you're stuck on a question:

- Ask me about it after class.
- Come to my office hours: Mon 4:30 - 5:30, Wed 4:30 - 5:30 in CP 317.
- Go to the Math Tutorial Lab in person in CP 303 or online.