Math 130 Spring 2006
www.timetodare.com Date assigned: 03/06

Activity Lab #2 (Group set)

25 points – Due Wednesday, March 22

Each group must have at least 2 students and may not be more than 3 students. Individual efforts will not be accepted. Make sure you SHOW AND JUSTIFY YOUR WORK in order to get credit. Turn in one assignment per group. Do not just write down an answer. No proof, no credit given.

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1. Consider the following polynomial function $f(x) = -6x^4 - x^3 + 39x^2 - 21x - 20$. Questions a-i below relate to this polynomial function.

a) Use the leading term to describe the lon-term behavior of this function; that is, what happens as $x \to \pm\infty$.

b) Use synthetic division to divide $f(x)$ by $x - \frac{4}{3}$ and relate dividend, divisor, quotient and remainder in an equation.

c) Compute and compare the values of $f(-1)$ and $f(0)$. What can you conclude using the intermediate value theorem?

d) State why the condition for the theorem on rational zeros is satisfied and use the theorem on rational zeros to list all possible rational zeros for $f(x)$.

e) Use synthetic division to divide $f(x)$ by $x + \frac{2}{3}$ and relate the dividend, divisor, quotient and remainder in an equation.

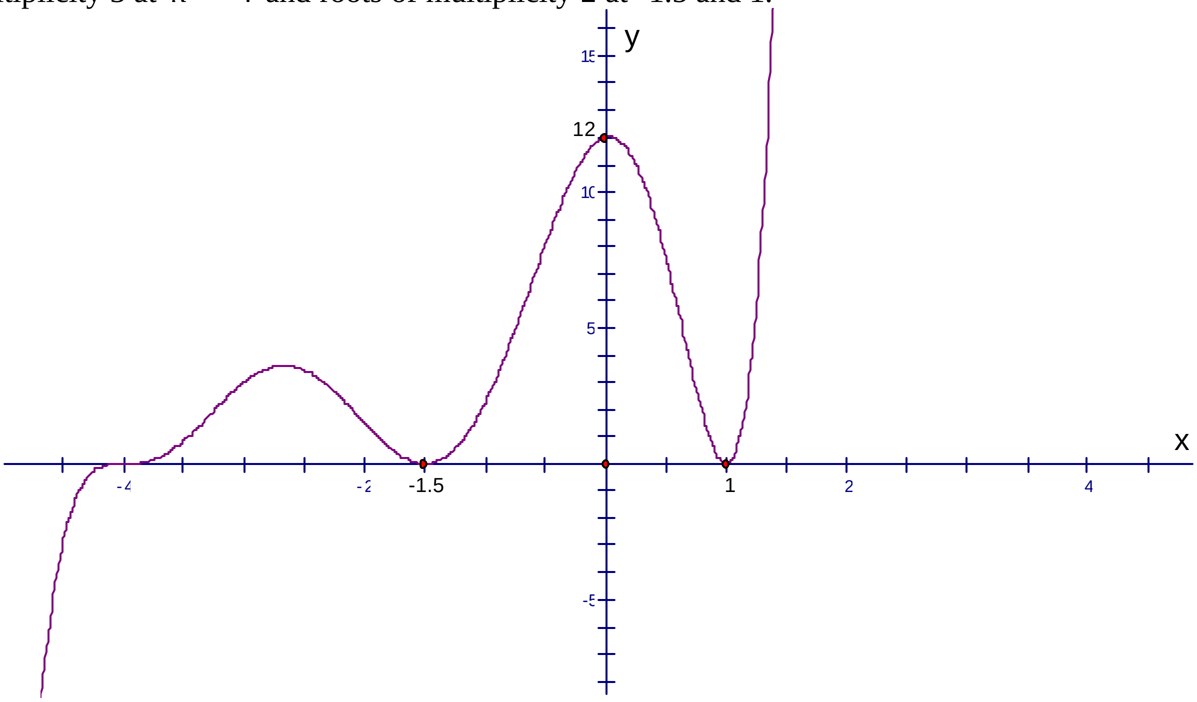
f) Use synthetic division to divide $f(x)$ by $x - \frac{5}{2}$ and then the theorem on bounds to show that $\frac{5}{2}$ is an upper bound on the roots of $f(x)$.

g) Use long division to show that $x^2 + x - 5$ is a divisor of $f(x)$ and relate the dividend, divisor, quotient and remainder in an equation.

h) Write $f(x)$ in completely factored form.

i) Sketch a graph of $f(x)$ showing how it passes through its intercepts.

2. Find a formula for the 7^{th} degree polynomial whose graph is shown. Hint: it has a root of multiplicity 3 at $x = -4$ and roots of multiplicity 2 at -1.5 and 1.



3. Find the values of a and b such that $x-1$ is a factor of both $x^3 + x^2 + ax + b$ and $x^3 - x^2 - ax + b$. Hint: Use the factor theorem and/or synthetic division.

4. Find all prime numbers p for which the equation $x^3 + x^2 + x - p = 0$ has at least one rational root. For each value of p that you find, find all the corresponding roots of the equation.

5. Show that the following equation has at least one real root. Locate the root between successive tenths: $x^3 - 3x^2 + 3x - 26 = 0$

6. Consider $y = \dfrac{x^3 + 6x^2 + 9x}{2x^3 - 2}$.

a) Factor the numerator and denominator.

b) What are the intercepts for this function?

c) What is the vertical asymptote?

d) What is the horizontal asymptote?

e) Plot additional points, as necessary, to get the shape of this function and sketch a graph.

7. Sketch the graph of the following showing all intercepts, asymptotes and additional points, as necessary, to get the shape.

$$y = \frac{(x^2 - 4)(2x^2 - 1)}{(x-1)^2(x^2 + x + 1)}$$