COLLEGE ALGEBRA

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GPS # 34 | 4.1 | POLYNOMIAL FUNCTIONS II

Class Time: T/Th 11:30 Date: 3-25-08

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Useful Guidelines:

To Graph a Polynomial function, $f(x) = a_n x^n + a_{n-1}x^{n-1} + \ldots + a_1 x + a_0,\ a_n \neq 0$

* Step 1: Find the x-intercepts, if any (by solving the equation $f(x) = 0$), and the y-intercepts, $f(0)$.
* Step 2: Determine whether the graph crosses (when r is a zero of odd multiplicity) or touches (when r is a zero of even multiplicity) the x-axis at each x-intercepts.
* Step 3: Check the end behavior: For large $|x|$, the graph of f behaves like the graph of $f(x) = a_n x^n$.
* Step 4: Determine the degree of $f = n$ and the maximum number of turning points on the graph of $f = n-1$.
* Step 5: Use the x-intercept(s) to find the intervals on which f is above the x-axis and the intervals on which f is above the x-axis. [Hint: pick a point between the zeros.]
* Step 6: Plot the points and connect them with a smooth and continuous curve. .

[r is called a (real) **zero of** f, or **root of** f when $f(r) = 0$]

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

(a) Find the x-intercepts and the y-intercepts of the above polynomial function f.

x-intercep: (-2,0) (2,0) (4,0)

y-intercept: (0, 32)

(b) Determine whether the graph touches or crosses the x-axis at each x-intercept.

At x = 4 the graph crosses because the zero has an odd mult.

At x = -2 the graph touches because the zero has an even mult.

At x = 2 the graph crosses because the zero has an odd mult.

(c) Check end behavior: Find the power function that the graph of f resembles for large values of $|x|$.

It will resemble $y = x^4$ for large $|x|$

(d) Determine the maximum number of turning points of the graph of f.

Since $n = 4$, the maximum number of turning points $= n - 1 = 4 - 1 = 3$

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(e) Use the x-intercept(s) to find the intervals on which the graph of f is above and below the x-axis.

(+) -2 (+) 2 (−) 4 (+)

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

$f(-3) = 35$

(f) Plot the points and connect them with a smooth and continuous curve.

$f(0) = (0-4)(0+2)^2(0-2)$

$f(0) = 32$

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

$f(3) = -25$

$f(5) = (5-4)(5+2)^2(5+2)$

$f(5) = 147$