Math Sheet #10 **Due August 12, 2005**

Name: .... Date: ....

1) $y = x^3 - 3x^2 - 24x + 5$

a. Using the definitions below, find the local maximum in the equation above.
b. Similarly, find the local minimum in the same equation.
c. Using Excel, graph the equation.

Definition of a critical point: a critical point on $f(x)$ occurs at x_0 if and only if either $f'(x_0)$ is zero or the derivative doesn't exist.

Definition of a local maxima: A function $f(x)$ has a local maximum at x_0 if and only if there exists some interval I containing x_0 such that $f(x_0) \geq f(x)$ for all x in I.

Definition of a local minima: A function $f(x)$ has a local minimum at x0 if and only if there exists some interval I containing x_0 such that $f(x_0) \leq f(x)$ for all x in I.

The first derivative test for local extrema: If $f(x)$ is increasing ($f'(x) > 0$) for all x in some interval (a, x_0] and $f(x)$ is decreasing ($f'(x) < 0$) for all x in some interval [x_0, b), then f(x) has a local maximum at x0. If $f(x)$ is decreasing ($f'(x) < 0$) for all x in some interval (a, x_0] and $f(x)$ is increasing ($f'(x) > 0$) for all x in some interval [x_0, b), then $f(x)$ has a local minimum at x_0.

The second derivative test for local extrema: If $f'(x_0) = 0$ and $f''(x_0) > 0$, then $f(x)$ has a local minimum at x_0. If $f'(x_0) = 0$ and $f''(x_0) < 0$, then $f(x)$ has a local maximum at x_0.