Math Sheet #10 **Due August 12, 2006**

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 $x_0$.