Curve Sketching Review 2

1) Let f be the function given by $f(x)=x^3-5x^2+3x+k$, where k is a constant.

   a. On what intervals is f increasing?
   b. On what intervals is f concave downward?
   c. Find the value of k for which f has 11 as its relative minimum.

2) Consider the curve defined by the equation $y+\cos y=x+1$ for $0\le y\le 2\pi$.

   a. Find $\frac{dy}{dx}$ in terms of y.
   b. Write an equation for each vertical tangent to the curve.
   c. Find $\frac{d^2y}{dx^2}$ in terms of y.

3) Consider the curve given by $x^2+4y^2=7+3xy$

   a. Show that $\frac{dy}{dx}=\frac{3y-2x}{8y-3x}$
   b. Show that there is a point on the curve P, where the x-coordinate is 3 at which the line tangent to the curve at point P is horizontal. Find the y-coordinate.
   c. Find the value of $\frac{d^2y}{dx^2}$ at point P (from part b). Does the curve have a local maximum, local minimum or neither at point P? Why?

4) The figure below shows the graph of $f'(x)$, the derivative of $f(x)$. Using the domain for $f(x)$ is $-1\le x\le 5$, where $f'(x)$ graph has a horizontal tangent at $x=1$, and $x=3$. Given $f(2)=6$.

   a. Find the x-coordinate of each point of inflection of $f(x)$. Give a reason.
   b. Where does $f(x)$ have and absolute minimum? Where does $f(x)$ have an absolute maximum?
   c. If $g(x)=x\cdot f(x)$, find the equation of the line tangent to $g(x)$ at x = 2.