(8*pts*) **Problem 1**
Evaluate the following limits

$$(a) \quad \lim_{x\to 1} \frac{7-9x^3}{x+1} \qquad (b) \quad \lim_{x\to -\infty} \frac{2\left|x^3\right|+12x+100}{1-9x}$$

$$(c) \quad \lim_{x\to 6} \frac{\sqrt{10+x}-4}{x-6} \qquad (d) \quad \lim_{x\to e} \frac{\ln x^3-3}{x^2-e^2}$$

(8*pts*) **Problem 2**
For what value (s) of the constants p and q that make f continuous at $x = 2$.

$$f(x) = \begin{cases} p + qx, & \text{if } x > 2 \\ 3, & \text{if } x = 2 \\ q - px^2 & \text{if } x < 2 \end{cases}$$

(8*pts*)**Problem 3**

Find $\dfrac{dy}{dx}$ for

(a) $y = (3^x + \log_4 \sqrt{x})\,(\tan x + \sin x)$

(b) $y = \ln \sqrt[9]{x-1}$

(c) $y = e^{\cos x + \sec x}$

(d) $xy^3 + e^x y = \ln x$

(6*pts*) **Problem 4**
Let f be a differentiable function such that $f(2) = 2,\ f(4) = 1,\ f\,'(2) = 3$ and $f\,'(4) = -1$. If $G(x) = f(2x) \cdot f(x)$, find $G'(2)$ and the equation of the tangent line to the graph of G at $x = 2$.

(5pts) **Problem 5**
A particle is moving along the hyperbola $xy = 16$. As it reaches the point $(8, 2)$, the y-coordinate is decreasing at a rate of $3cm/s$. How fast is the x-coordinate of the point changing at that instant?

(5pts)**Problem 6**
Find the open interval (s) over which the function $f(x) = 3x^4 - 4x^3 - 12x^2 + 9$ is decreasing.