First Name:_____ Last Name: _____ Student ID: _____

## Review Questions

**1.** Compute each limit.

a. $\lim_{x\to 3} \frac{9-x^2}{x^3-27}$

b. $\lim_{x\to -2} \frac{x-2}{x+2}$

c. $\lim_{x\to -\infty} \frac{-2x^6-8}{-2x^5+5}$

d. $\lim_{x\to 3} \frac{\sqrt{7-x}-2}{x-3}$

**2.** For each case find $f'(x)$:

a. $f(x) = 2x^3 - 7x^2 + x + \pi$

b. $f(x) = 2\sqrt{x} + 3\sqrt[3]{x} + 4\sqrt[4]{x}+\ldots+2016\sqrt[2016]{x}$

c. $f(x) = -\frac{1}{x} - \frac{1}{x^2} - \frac{1}{x^3} -\ldots- \frac{1}{x^{2016}}$

d. $f(x) = \frac{3x^7-2x^5+x^3-10x^2+1}{x^2}$

e. $f(x) = \frac{x^2-1}{x^2+1}$

f. $f(x) = (\frac{x+1}{x-1})^{10}$

g. f(x) = $\sin^3(x^3-1)$ h. f(x) = ln(sinx)

**3.** Use the first principles to find the derivatives of f(x) = $x^3 - 1$.

**4.** For each case, use the first derivative sign to find the intervals of increase or decrease, LM, Lm.

a. f(x) = $x^3 - 3x^2 + 1$ b. f(x) = $\frac{x^2}{1+x^2}$

c. f (x) = $e^x(x^2 + 1)$.

**5.** Use implicit differentiation to find $y'(1)$ if $y(x)$ is defined by the equation $x^3 + y^3 = 2x$.

**6.** Analyze the differentiability of the functions:

a. y = f(x) = $|x - 3|$

b. y = f(x) = $\begin{cases} -x^2 + x + 1 & if\ x \geq 0 \\ x^2 + x + 1 & if\ x < 0 \end{cases}$

**7.** Find a function of the form $f(x) = ax^4 + bx^2 + cx + d$ with a local maximum at (0, −6) and a local minimum at (1, −8) .

**8.** Evaluate $h'(e^2)$ for $h(x) = \sqrt{\ln x}$.

**9.** If $g(x)=e^{2x-1}\ln(2x-1)$, evaluate g'(1).

**10.** Evaluate f'(2) for f(x) = $\cos\frac{\pi}{x}$.

**11.** Determine f'(0) for f(t) = $2e^{3t}$-5t.

**12.** Find $\frac{dy}{dx}$ at x = 0 for y = $\frac{x\cos x}{1+e^{x}}$.