Show all work for full credit and no calculators or electronic devices allowed.

Name and section: _____

1. Compute the limits

   (a) $\lim_{x \to 3} x^3 + 1$

   (b) $\lim_{x \to 3} \dfrac{x^2 - x - 6}{x^2 - 9}$

(c) $\lim_{x \to 1} \dfrac{x^2}{x^2 - 1}$

(d) $\lim_{x \to -1} \dfrac{1}{x + 1}$

(e) $\lim_{x \to 0} \dfrac{\sin(x)}{3x}$

(f) $\lim_{x \to 0} \dfrac{\sin^2(x)}{x}$

(g) $\lim_{n\to\infty} \dfrac{n^3 - 2n + 1}{3n^3 + 5}$

(h) $\lim_{n\to\infty} \dfrac{3n + 11}{3n + 11n^2}$

2. Compute the derivative using the **definition** of the derivative

$$f(x) = 3x^2 - x$$

3. Compute the derivative from the formulae.

   (a) $f(x) = 3x^2 + 5\sqrt{x} - 3\ln(x)$

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

(c) $f(x) = 5\sqrt{x}(e^x - 3)$

(d) $f(x) = 7\cos(x)\ln(x)$

(e) $f(x) = (x^3 + 1)^4(3x - 2)^7$

(f) $f(x) = \frac{\sin x}{\cos x}$

Formulae

0. $\dfrac{d}{dx}[k] = 0$
1. $\dfrac{d}{dx}[x^n] = nx^{n-1}$
2. $\dfrac{d}{dx}[e^x] = e^x$
3. $\dfrac{d}{dx}[\ln x] = \dfrac{1}{x}$
4. $\dfrac{d}{dx}[\sin x] = \cos x$
5. $\dfrac{d}{dx}[\cos x] = -\sin x$

The Power Rule

$$\frac{d}{dx}[(f(x))^n] = n(f(x))^{n-1}f'(x)$$

The Product Rule

$$\frac{d}{dx}[FS] = F'S + FS'$$