Name: _____

Instructions: Answer all problems in the space provided! No calculators! Use your own scrap paper.

1. State the following rules (as equations); using f and g (functions of x) to illustrate:

   (a) The product rule: _____   (b) The power rule: _____

   (c) The quotient rule: _____   (d) The chain rule: _____

   (e) $\frac{d}{dx} e^u =$ _____   (f) $\frac{d}{dx} \tan^{-1} x =$ _____

2. Compute the limits:

   (a) $\lim\limits_{x \to 2} \frac{x^3 - 4x}{2-x} =$ _____   (b) $\lim\limits_{x \to \infty} \frac{2x^3 - 5x + 1}{4 - 3x^3} =$ _____   (c) $\lim\limits_{x \to 0} \frac{x \cos 3x}{\sin 4x} =$ _____

3. Differentiate:

   (a) $y = \frac{5x^2 + \sin x}{\pi}$ _____   (b) $y = \ln \frac{2x}{\sqrt{x+8}}$ _____

   (c) $y = 4x^5 (2x + 1)^7$ _____

4. Integrate:

   (a) $\displaystyle\int \frac{4x^2 - 4x + 1}{x^{3/2}} \, dx =$ _____   (b) $\displaystyle\int \sin(\cos x) \sin x \, dx =$ _____

   (c) $\displaystyle\int x \sin(x^2) \, dx =$ _____   (d) $\displaystyle\int \frac{1}{x \ln x} \, dx =$ _____

5. Sketch the following functions (do a mini sketch under the function's name, label intercepts):

   (a) $y = \cos x$ (b) $y = x^3$ (c) $y = x^2$
       (principal period)

   (d) $y = x^3 - 4x$