MAT 111 **Sample Basic Skills Exam #1**

Calculators are not allowed on this exam. Please show your work and be as neat as possible.

1. [5 points] State the definition of $f'(x)$ at $x = a$.

2. [10 points] Use the definition of the derivative to compute $f'(2)$ when $f(x) = x^2 - 3x$.

3. [7.5 points each] Evaluate the following limits:

   a) $\lim_{x \to 3} \dfrac{x^2 - 9}{x - 3}$

   b) $\lim_{x \to \infty} \dfrac{2x^2 + 3x - 2}{x^2 - 4}$

4. [10 points] Find the equation of the line tangent to the graph of $f(x) = \dfrac{2x}{x - 5}$ at the point where $x = 1$.

5. [10 points each] Compute derivatives of the following:

   a) $f(x) = e^x \cos x + (3x^2 - 5x + 2)^8 - \arctan x$

   b) $g(x) = \dfrac{4 \sin x}{\sqrt{x}} + \ln(5x) + \cos \pi$

   c) $h(x) = x^{1/3} - \sin(x^2 - 3) + 16^x$

6. [10 points] Given $x^2 - 5xy + 3y^2 = 3$, compute $\dfrac{dy}{dx}$ in terms of x and y.

7. [10 points each] Find antiderivatives for each of the following:

   a) $f(x) = x^{1.3} + \dfrac{1}{x} - \sin(3x)$

   b) $g(x) = e^{x+1} + \pi + \dfrac{1}{1 + x^2}$