MATH 2250, PRACTICE SHEET FOR EXAM 1

1. Use the definition of the derivative to compute the following derivatives:

   a. $\dfrac{d}{dx}\left(x^2 - x\right)$

   b. $\dfrac{d}{dx}\left(\sqrt{x-1}\right)$

   c. $\dfrac{d}{dx}\left(1/x + \sqrt{x}\right)$

   d. $\dfrac{d}{dx}\left(\sin x\right)$

2. Use the derivative rules to compute the following derivatives. Show your work!

   a. $\dfrac{d}{dx}\left(\sqrt{x-1}\cos x\right)$

   b. $\dfrac{d}{dx}\left(\dfrac{1}{1 - \frac{1}{\sin x}}\right)$

   c. $\dfrac{d}{dx}\left(\sqrt[5]{x^{-3/2}} - \cot(x)\right)$

   d. $\dfrac{d}{dx}\left(\dfrac{x-1}{x+1}\right)$

   e. $\dfrac{d}{dx}\left(e^{-x}\right)$

3. Compute the following limits:

   a. $\displaystyle\lim_{x\to 9} \frac{(x-3)(\sqrt{x}-3)}{x-9}$

   b. $\displaystyle\lim_{x\to 0} \frac{\sin^3(2x)}{x^2\tan(x)}$

4. Explain why $\displaystyle\lim_{x\to 0^+} x\sin(x^3 - \ln x) = 0$.

5. Suppose that f, g, h are functions such that $h(x) = f(g(x))$. Suppose that $g(1) = 2$, $g'(1) = 4$, and $h'(1) = 12$. What is $f'(2)$?

6. Let $x = y + e^y$. Note that if $y = 1$, then $x = 1 + e$. Find the value of the derivative $\frac{dy}{dx}$ when $x = 1 + e$.