1. Find the derivatives of the following functions. Do not simplify your solutions.

(a) $y = \dfrac{3x^3 - x^2 + 1}{5x^2 - 2x + 3}$

(b) $y = 2^x x^2$

(c) $y = e^{1/x} \sin x$ (use the chain rule to find $\frac{d}{dx} e^{1/x}$)

(d) $y = \cos(\tan x)$ (use the chain rule)

2. Find the following limit:

$$\lim_{x \to 0} \frac{\sin(3x)}{\sin(5x)} \quad \left(\text{recall } \lim_{x \to 0} \frac{\sin x}{x} = 1\right).$$

3. Two cars start at the same point at time $t = 0$ (time measure in hours), car 1 heading due east at 40 mph and car 2 heading due south at 30 mph.

   (a) What is the distance between the two cars as a function of time?

   (b) How fast is the distance between the two cars increasing after an hour?