Name: **Homework 4**

Instructions: This homework is an individual effort. Answer each question. This is due on **Wednesday, February 26th**. **Show all work to receive full credit.**

1. Find the derivative of the following functions and find the tangent line to each function at $(1, f(1))$.
   a. $f(x) = \ln(1)$
   b. $f(x) = \sqrt{x^2 + 4}$
   c. $f(x) = \left(\frac{x^2 + 2}{3}\right)^2$
   d. $f(x) = \frac{x - 4}{x + 4}$
   e. $f(x) = 7x^2 - 3^x + \ln(x^2)$
   f. $f(t) = \frac{e^{2t}}{t^2 + 1}$
   g. $f(x) = 5x^3 + 7x^2 - 3x + 1$
   h. $f(x) = \frac{3x^2 - 4x + 1}{3x - 1}$
   i. $f(x) = \frac{\sqrt{x^2 + 4}}{\ln(x^2 + 1)}$
2. King Kong is going on a rampage in new York City. He climbed his way to the top of the empire state building all while swatting planes and holding Ann Darrow. However, King Kong is getting old and his grip is not as good as it used to be (poor King Kong). Thus, he accidently drops Ann! In order to save her, they must get the appropriate net for thr speed she falls. After the last King Kong did this, a mathematician came up with a formula for the height of Ann above the ground in feet with respect to time in seconds after being dropped.

$$h(t) = 1250 - 16t^2$$

   a. Find an equation for the velocity and acceleration at which Ann fell in terms of time t.
   b. In order to determine which net to use, they must first find the time it takes for Ann to reach the ground. Help the police with this task!
   c. Given the above, sketch a graph of all 3 functions! ($h(t)$, $v(t)$, $a(t)$)
   d. Given part (a), determine which of 4 nets works for catching Ann! (Explain to the cops why this is true with your work!)
      (1) Can take speeds up to 100 ft per second
      (2) Can take speeds up to 200 ft per second but would be recoil anything under 100 ft per second
      (3) Can take speeds up to 300 ft per second but would be recoil anything under 200 ft per second
      (4) Will only work for speeds above 400 ft per second.
   e. Draw a depiction of the scene! Be creative!