Math E-15 Homework 5

1. Find the derivative of each of the following functions.
   
   (a) \( y = \sin(7x) \)
   (b) \( y = 2\sin(7x) \)
   (c) \( y = \cos(2\sin(7x)) \)
   (d) \( y = \ln(\sin(x^3)) \)
   (e) \( y = \sqrt{\arctan(\log_{10}(5x))} \)
   (f) \( y = e^{3x} \cdot \tan(2x^4) \)
   (g) \( y = \sin(\cos(x \cdot 2^{3x})) \)
   (h) \( y = (1 + x^6)^{8x} \)
   (i) \( y = e^x + \ln 3 + \sin 4 + \arctan 5 \)

2. Consider the function \( f(x) = e^{-x^2} \).
   
   [Remember that \( e^{-x^2} \) means \( e^{-(x^2)} \), NOT \( (e^{-x})^2 \) and that \( -x^2 \) means \( -(x^2) \), NOT \( (-x)^2 \).]
   
   Note: Be sure to show enough work on parts (a) and (b) that it is clear to the grader how you used calculus (and not a graphing calculator or someone else’s paper) to do the problem.

   (a) On what interval(s) is \( f \) increasing? On what interval(s) is \( f \) decreasing?
   (b) On what interval(s) is \( f \) concave up? On what interval(s) is \( f \) concave down?
   (c) Sketch a graph of \( f \), labeling the points you found above.