Math 163A Guide for Test 2

Here are some sample questions from Sections 3.3–5, 4.1, and 4.2. Some topics that we covered are not represented by these questions, but are still fair game.

1. Let \( f(x) = -x^2 + 3 \).
   
   (a) Using the definition of the derivative as a limit, compute \( f'(x) \).
   
   (b) Find the equation for the tangent line at \( x = 2 \).
   
   (c) Graph \( f(x) \) and the tangent line.

2. The graph of a function \( f \) is given below. On the same axes, sketch the graph of \( f' \).

3. Compute the following derivatives:
   
   (a) \( f(x) = 2 + x + \frac{3}{x} - \sqrt{x} - 5x^7 + x^{3/4} \)
   \[ \Rightarrow f'(x) = \]

   (b) \( y = \frac{x^3 + x}{x} \) \( \Rightarrow \frac{dy}{dx} = \)

   (c) \( D_x \left[ (x^9 + x^8 + x^5 + 3)(1 + 2x^2 + 9x^3 - 4x^4) \right] = \)

   (d) If \( f(x) = \frac{u(x)v(x)}{w(x)} \), then in terms of \( u(x), v(x), w(x), u'(x), v'(x), \) and \( w'(x) \), we have \( f'(x) = \)