Math 261 - Lab 9   Introduction to Derivatives   Name: _____
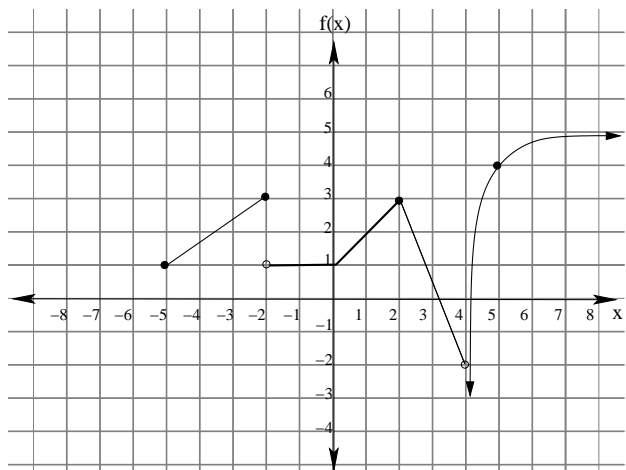
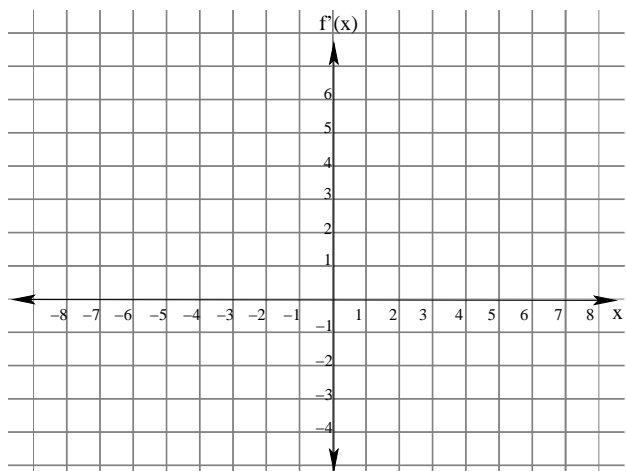*Show all work for credit. Also, give exact answers unless otherwise noted.*

1. The graph of a function $f(x)$ is given below.

   (a) Find where f is not continuous.

   (b) Find where f is not differentiable.

2. Sketch the graph of $f'(x)$, the *derivative* of $f(x)$ (shown above) as accurately as you can on the grid provided.

3. Find the derivative of each of the following functions. Simplify your answers completely.

(a) $y = x^2 - 3x + 7$

(b) $y = 5t^4 - 4t^3$

(c) $f(x) = \dfrac{4x^5}{10} - 3x^{\frac{4}{3}}$

(d) $g(z) = 5z^{-3} + \dfrac{1}{z}$

(e) $f(x) = 5x^3 - 10x + 7 - \dfrac{5}{x^2}$

(f) $g(t) = \dfrac{x^3 - 3x^2 + 7x}{x^2}$

(g) $y = (x^2 - 1)(x^2 + 3x - 7)$

(h) $y = (x - 1)(x^5 + x^4 + x^3 + x^2 + x + 1)$

(i) $f(x) = \dfrac{3x - 7}{7x - 2}$

(j) $g(z) = \dfrac{z^2 - 4}{2z + 5}$

(k) $f(t) = (3 - 2t)(t^2 - 3)^{-1}$

(l) $g(p) = \dfrac{\sqrt{p} + 4}{\sqrt{p} + 4}$

(m) $y = \dfrac{x^2 + 3x - \sqrt{x}}{x}$

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

4. Find the following higher order derivatives. Simplify your answers completely.

(a) Find $f''(x)$ if $f(x) = x^5 - \sqrt{x} + 5x^{-1}$.

(b) Find $g''(x)$ if $g(x) = \dfrac{x^4}{4} + \dfrac{x^2}{2} + \dfrac{x}{7}$.

(c) Find y'' if $y = \dfrac{(x^2 + x)(x^2 - x + 1)}{x^4}$.

(d) Find y''' if $y = 5x^7 - \dfrac{4}{x^2}$.