Math 21A
Kouba
Challenge Discussion Sheet 5

1.) For each function $y = f(x)$ solve $f'(x) = 0$ for x and set up a sign chart for f'.

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

   b.) $f(x) = \sin(x-2)^2$ for $0 \le x \le 2\pi$

   c.) $f(x) = (x-1)^3(15-x)^4$

2.) Differentiate each function. Do not simplify your answers.

   a.) $f(x) = x^4 \sec^3(x^3)$

   b.) $g(x) = (3x - \sin^2(3x))^{50}$

   c.) $y = \dfrac{\tan x \cdot \sin(3x)}{\cos(2x) \cdot \sec(4x)}$

   d.) $f(x) = \dfrac{\tan(\sin x)}{\cos(\sec x)}$

3.) An egg is dropped from a high building and strikes the ground 10 seconds later. From how high was the egg dropped ? What is the egg's speed in miles per hour as it strikes the ground ?

4.) A 30-pound watermelon is dropped from a high building and falls and strikes the ground with a speed of 200 miles per hour. From how high was the watermelon dropped? For how many seconds did the watermelon fall ?

5.) Sally, the parachutist, jumps from an airplane and free falls vertically until reaching a terminal velocity. If Sally reaches her terminal velocity after 10 seconds, then releases her parachute and falls for another 50 seconds at the constant speed of 21 feet per second, how high was the airplane when Sally jumped ?

6.) For each function $y = f(x)$ solve $f'(x) = 0$ and $f''(x) = 0$ for x and set up sign charts for f' and f''.

   a.) $f(x) = x(x-4)^3$

   b.) $f(x) = (\sqrt{3}/2)x + \cos x$ for $0 \le x \le 2\pi$

1