Math 231 Calculus 1 Fall 10 Sample midterm 2

(1) (32 points) Compute the derivative $\frac{dy}{dx}$. Do not simplify. Show all your work.

(a) $y = xe^x \sin(x)$

(b) $y = \frac{e^{-2x}}{x+\tan(2x)}$

(c) $y = (\sqrt[4]{2x} + \sqrt{x^2+2})^{11}$

(d) $y = \ln(x + \cos(3-x))$

(e) $xe^{x+y} = y - 1$

(2) (20 points) Let $f(x) = \frac{1}{3-2x}$

(a) Use the *definition of the derivative* to find $f'(x)$.

(b) Use any method to find $f''(1)$.

(3) (18 points) Graphs of $f(x)$ and $g(x)$ are shown below. Show all your work.

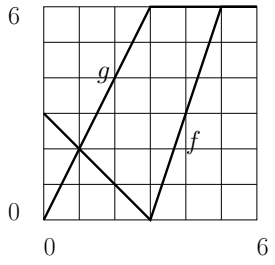

FIGURE 1

(a) Let $f(x) = f(x)g(x)$. Find $A'(1)$.

(b) Let $B(x) = f(g(x))$. Find $B'(1)$.

(c) Let $C(x)$ be the inverse function of $g(x)$ for $0 \leq x \leq 3$. Find $C(4)$ and $C'(4)$.

(4) (10 points) Find an equation for the tangent line to $x^2y^3 + 2y = 3x$ at the point $(2, 1)$.

(5) (12 points) A ball is thrown vertically upwards with a velocity of 20 m/s.

(a) Find the maximum height of the ball.

(b) Find the velocity of the ball when it first reaches 5m.

(6) (15 points) A rocket travels vertically at a speed of 800mph. The rocket is tracked by a telescope located 10 miles from the lauch pad. Find the rate at which the angle between the telescope and the ground is increasing 3 minutes after lift off.