

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) $y = \frac{e^{5x}}{7 + \cos(3x)}$

(b) $y = (\sqrt[3]{7x} + \sqrt{x^2 + 4})^{14}$

(c) $y = \ln(2 + \tan(3x + 4))$

(d) $xe^y = y - 1$

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

(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.

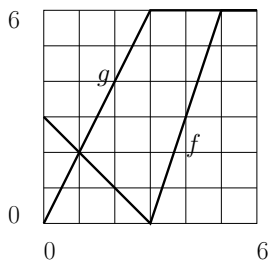


FIGURE 1

(a) Let $f(x) = f(x)g(x)$. Find $A'(2)$.

(b) Let $B(x) = f(g(x))$. Find $B'(2)$.

(c) Let $C(x)$ be the inverse function of $g(x)$ for $0 \leq x \leq 3$. Find $C(2)$ and $C'(2)$.

(4) (10 points) Find the two points on the ellipse $x^2 + 2y^2 = 1$ where the tangent line has slope 1.

- (5) (12 points) A ball is thrown vertically upwards with a velocity of 25 m/s.
- (a) Find the maximum height of the ball.
 - (b) Find the velocity of the ball when it first reaches 10m.
- (6) (15 points) A baseball diamond is a square with side lengths 30m. A batter hits the ball and runs towards first base at a speed of 8 m/s. At what rate is his distance to second base decreasing when he is half way to first base?