

Practice Test B for Midterm Exam 2

Instructions: This optional exam is for practice, to give you an idea of what our in-class midterm exam will be like. I'd recommend that you try taking it in exam conditions: 50 minutes, closed-book.

1. **(25 points)** Compute the following derivatives by any legal method. Simplify when asked to do so.

(a). Compute $f'(x)$, where $f(x) = x^2 \sec(3x - 5)$. Simplify your answer.

(b). Compute $g''(x)$ (the *second* derivative), where $g(x) = \frac{x^2 - 4x + 3}{\sqrt{x}}$. Simplify your answer.

(c). Compute $h(x) = \sqrt{x} + \frac{1}{\sqrt{x}} + \frac{1}{1 + \sqrt{x}} + \frac{1}{\sqrt{1+x}}$. (Do not simplify your answer.)

(d). Compute $g'(x)$, where $g(x) = \left(\frac{1}{x^3} + \pi\right)^4 \cdot \left(x^4 - \frac{1}{x^7}\right)^{-5}$ (Do not simplify your answer.)

2. **(15 points)** Find the **locations** of the **absolute maximum** and **absolute minimum value(s)** of the function

$$F(x) = (x - 1)^2(2x - 10)^2 \quad \text{on the interval} \quad [0, 4].$$

3. **(18 points)** The top of a 10 foot ladder is sliding down a vertical wall at the rate of 1 foot per second. Consider the angle formed by the bottom of the ladder and the ground. How fast is this angle changing when the top of the ladder is 6 feet above the ground?

4. **(14 points)** Consider the equation: $xy^3 + y \cos x = 3 + y^2 \sin x$
Find the equation of the tangent line to this curve at the point $(0, 3)$.

5. **(12 points)** Suppose $f(x)$ is a function with the property that

$$f(2) = 5, \quad f'(2) = -1, \quad f(4) = 3, \quad \text{and} \quad f'(4) = 2.$$

Let $g(x) = f(x^2)$ and $h(x) = (f(x))^2$. Compute $g'(2)$ and $h'(2)$.