Test 1 Review

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Test 1 Material

- Test 1 will cover material through 3.8.
- Test 1 will NOT have material from section 2.2 (ϵ, δ problems), the portion of section 2.5 covering the pinching theorem, section 2.6 (extreme value theorem), or the falling object problems from section 3.4.

Good Sources of Practice Problems

- Examples from class.
- The basic homework problems.
- The basic online quiz problems.
- The list of problems in the following slides

Problem 1

$$\lim_{x \to 2} \left(2x^2 - 3x + 5\right)$$

Problem 2

$$\lim_{x \to 1} \frac{x^2 - 1}{x + 3}$$

Problem 3

$$\lim_{x \to -3} \frac{x+4}{x^2-9}$$

Problem 4

$$\lim_{x \to 2} \frac{x^2 - 6x + 8}{x^2 - 4}$$

Problem 5

$$\lim_{u \to 0} \frac{\sin u}{u}$$

Problem 6

$$\lim_{x \to 0} \frac{2x}{\sin(3x)}$$

Problem 7

$$\lim_{x \to 0} \frac{x^2}{1 - \cos x}$$

Problem 8

$$\lim_{x \to \frac{\pi}{2}} \frac{\sin x}{2x}$$

Problem 9

$$\lim_{x \to 0} \frac{\sin(7x)}{\sin(5x)}$$

Problem 10

$$\lim_{x \to 0} 2x \cot 3x$$

Problem 11

Let

$$f(x) = \begin{cases} \dfrac{x^2 - 9}{x^2 - 4x + 3}, & x \neq 3, x \neq 1 \\ 2, & x = 3 \text{ or } x = 1. \end{cases}$$

Discuss the continuity of f.

Problem 12

Give A, B so that

$$f(x) = \begin{cases} Ax + 1, & x < 1 \\ 2, & x = 1, \\ 3 - Bx^2, & x > 1 \end{cases}$$

is continuous.

Problem 13

Use the definition of derivative to find

$$\frac{d}{dx}\left(x^2 + 2x - 3\right)$$

Problem 14

Use the definition of derivative to find

$$\frac{d}{dx}\left(\frac{2}{x-3}\right)$$

Problem 15

Give the tangent line to $f(x) = 3x^3 - 2x^2$ at $x = -1$.

Problem 16

Give the normal line to $f(x) = \sqrt{x-1}$ at $x = 10$.

Problem 17

$$\frac{d}{dx} sin^2(3x)$$

Problem 18

$$\frac{d}{dx}\left(\frac{sinx}{2x+1}\right)$$

Problem 19

Find the derivative of

$$f(x) = \sec(3x) + \cot(4x^2 + 1)$$

Problem 20

Find $(g \circ f)'(1)$ given that

$$f'(1) = 2, f(1) = 3, g(1) = 4, f(3) = -2, g'(3) = 6, f'(3) = 5.$$

Problem 21

Find $\frac{dy}{dx}$ given that

$$2x^2 + 3xy - y^3 = x - 1$$

Problem 22

Find the slope of the tangent line to the graph of

$$x^2 + \cos(x + y) + y = \pi - 1$$

at the point $(0, \pi)$.

Problem 23

Find $\frac{d^2y}{dx^2}$ given that

$$x^2 + 2xy^2 + 3y = 6$$

Problem 24

A 5 foot tall gril is walking towards a 21 foot lamp post at the rate of 2 feet per second. How fast is the tip of her shadow moving when she is 4 feet from the lamp post?

Problem 25

A 16 foot board is leaning against a vertical wall. If the bottom of the board slides away from the wall at the rate of 3 feet per second, how fast is the area of the triangle formed by the board, the floor and the wall changing at the instant when the bottom of the board is 8 feet from the wall?

Problem 26

A pile of trash in the shape of a cube is being compacted into a smaller cube. Suppose the volume is always a cube and the volume is decreasing at the rate of 3 cubic meters per minute. Find the rate of change of an edge of the cube at the instant that the volume is exactly 64 cubic meters.

Problem 26

A spherical snowball is melting in such a way that it always retains its spherical shape. The surface area of the snowball is decreasing at the rate of 4 square centimeters per second. Find the rate of change of the volume when the radius is 2 cm.