Test 2 Material

- Evaluating limits of basic functions, rational functions, and piecewise defined functions.
- Evaluating the variations on sin(*u*)/*u* type limits.
- Continuity.
- Computing a derivative by using the definition of derivative.
- Basic derivatives using the sum, product and quotient rules.
- Derivative of trigonometric functions.
- Chain rule.
- Tangent and normal lines.
- Implicit differentiation.
- Related rates.

Test 2 will NOT have material from section 2.2, the portion of section 2.5 covering the pinching theorem,

or the extreme value theorem from section 2.6.

Good sources of practice problems:

- Examples from class.
- Popper questions from class.
- Homework problems.
- EMCF problems
- Online quiz problems.
- The list of problems in the following slides.

$$\lim_{x \to -2} \left(x^2 + 3x - 4 \right) =$$

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

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

$$\lim_{x \to -5} \frac{x^2 - 25}{x^2 + 4x - 5} =$$

$$\lim_{x \to -5} \frac{x - 5}{x^2 + 4x - 5} =$$

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

$$\lim_{x \to 1} \frac{x - 1}{x^2 - 4x + 3} =$$

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

$$\lim_{u\to 0} \frac{\sin(4u)}{\sin(7u)} =$$

$$\lim_{u\to 0} \frac{u^2}{1-\cos(u)} =$$

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

Give the set on which the function $f(x)=\dfrac{x^2+2x+1}{x^2-3x-4}$

is continuous.

Give values of A and B so that the function $g(x)=\begin{cases} Ax+B, & x<2 \\ 4, & x=2 \\ Ax^2-2B, & x>2 \end{cases}$

is continuous.

Give values of A and B so that the function $g(x)=\begin{cases} Ax+1, & x<0 \\ 3, & x=0 \\ Ax^2-2B, & x>0 \end{cases}$

is continuous.

$$\frac{d}{dx}\left(\frac{2x^2}{3x^2+x-1}\right)$$

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

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

Give the equation for the tangent line to the graph of $g(x) = 2x^2 + 3x - 2$ at the point where $x = -1$.

$$\frac{d}{dx}\left(\tan\left(1-3\sqrt{x}\right)+\sin\left(2x^2+1\right)\right)$$

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

Find $\frac{d}{dx} f\left(g\left(x\right)\right)$ at $x=-1$, where $g(-1)=2$, $f(-1)=3$, $f\left(2\right)=-4$, $g'\left(-1\right)=2$, $f'\left(2\right)=6$ and $f'\left(-1\right)=-4$.

Find $\left(f\circ g\right)'\left(-1\right)$, where $g(-1)=2$, $f(-1)=3$, $f\left(2\right)=-4$, $g'\left(-1\right)=2$, $f'\left(2\right)=6$ and $f'\left(-1\right)=-4$.

Use the definition of derivative to find the derivative of $f(x) = 2x^2 - 3x + 1$.

Use the definition of derivative to find the derivative of $f(x) = \sqrt{x-1}$.

Use the definition of derivative to find the derivative of $f(x) = \dfrac{1}{x+2}$.

Give a formula for $\frac{dy}{dx}$ in terms of x and y, given that $x^3 - 2xy + 3y^3 = 6$.

Give the slope of the normal line to the graph of $x^4 + 2xy + 2y^3 = 2y$ at the point $(0,1)$.

Give the equation of the tangent line to the graph of $x^4 + 2xy + 2y^3 = 2y$ at the point $(0,1)$.

Give the value of $d^2\text{y}/dx^2$ at the point $(0,1)$, given that $x^2 + 2xy + 2y^2 = 2$.

A 5 foot tall girl is walking towards a 21 foot lamp post at the rate of 3 feet per second. How fast is the tip of her shadow moving when she is 8 feet from the lamp post?

A 12 foot board is leaning against a vertical wall. If the bottom of the board slides away from the wall at the rate of 2 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 6 feet from the wall?

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 2 cubic meters per minute. Find the rate of change of an edge of the cube at the instant that the volume is exactly 27 cubic meters.

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 2 cubic meters per minute. Find the rate of change of surface area of the cube at the instant that the volume is exactly 27 cubic meters.

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 2 cubic centimeters per second. Find the rate of change of the volume when the surface area is 24 cm^2.