Name:_____

Calculus I Review Problems

The first few pages of this portion of the note packet includes review problems from Calculus I. Please feel free to try these problems when you have time. In class, we will start with Section 6.1.

1. State the precise definition of $\lim_{x \to a} f(x) = L$.

2. Compute the following limits.

   (a) $\lim_{x \to 4} \dfrac{x^2 + 3x - 4}{x^2 + 6x + 8}$

   (b) $\lim_{x \to \infty} \dfrac{3x^2 - 17}{8x^2 - 19x + 2}$

3. State both forms of the definition of the derivative of a function f at $x = a$. What does the derivative represent in terms of the graph of $f(x)$?

4. Fill in the following table of derivatives. Here, c is a constant, and f and g are differentiable functions.

$\frac{d}{dx}(c) =$	$\frac{d}{dx}(cf(x)) =$
$\frac{d}{dx}(f(x)+g(x)) =$	$\frac{d}{dx}(f(x)g(x)) =$
$\frac{d}{dx}(f(x)-g(x)) =$	$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) =$
$\frac{d}{dx}(x^n) =$	$\frac{d}{dx}(f(g(x))) =$
$\frac{d}{dx}(\sin(x)) =$	$\frac{d}{dx}(\csc(x)) =$
$\frac{d}{dx}(\cos(x)) =$	$\frac{d}{dx}(\sec(x)) =$
$\frac{d}{dx}(\tan(x)) =$	$\frac{d}{dx}(\cot(x)) =$

5. Use any rules from Calculus I to compute the derivative of each of the following functions.

(a) $f(x) = x^5 + 4x^2 + 7 - 3x^{-6} + \frac{2}{\sqrt[3]{x}} + \pi^\pi$

(b) $g(x) = x^2 \sin(x)$

(c) $h(t) = \tan(\sqrt{1-t})$

(d) $p(\theta) = \dfrac{\sec(2\theta)}{5 + \csc(2\theta)}$

6. Use implicit differentiation to find y' if $y^2 + \cos(y) + x^4 = 7x$.

7. Find the critical numbers of $f(x) = x^3 + 3x^2 - 24x$. For each critical number, determine if it is a local maximum, local minimum, absolute maximum, and/or absolute minimum.

8. How can you tell if a function is concave up on an interval? How can you tell if it is concave down on an interval?

9. State the definition of the definite integral of a continuous function f from $x = a$ to $x = b$. What does the definite integral represent graphically?

10. Fill in the following table of integrals. Here, c is a constant, and f and g are continuous functions.

$\int_a^b c\,dx =$	$\int_a^b cf(x)\,dx =$
$\int_a^b (f(x) + g(x))\,dx =$	$\int_a^b (f(x) - g(x))\,dx =$
$\int_a^b f(x)\,dx + \int_b^c f(x)\,dx =$	For $n \neq 1$, $\int x^n\,dx =$
$\int \sin(x)\,dx =$	$\int \cos(x)\,dx =$
$\int \sec^2(x)\,dx =$	$\int \csc^2(x)\,dx =$
$\int \sec(x)\tan(x)\,dx =$	$\int \csc(x)\cot(x)\,dx =$

11. State both parts of the Fundamental Theorem of Calculus.

12. Compute the following integrals.

(a) $\int_1^2 (8x^3 + 3x^2)\, dx$

(b) $\int_1^9 \frac{\sqrt{u} - 2u^2}{u}\, du$

(c) $\int_0^1 v^2 \cos(v^3)\, dv$

(d) $\int \sin(x)\cos(\cos(x))\, dx$