MATH 2554 : Exam 1 Review Sheet

Some Problems I recommend

- Section 2.3 : 41, 49, **50**, 56, **61**, 68
- Section 2.4 : 29, 38
- Section 2.5 : 31, 46, **78**
- Section 2.6 : 40, 86
- Section 3.1 : 23, 42
- Section 3.2 : 24a, 26a, **30a**

Especially important ones in **bold**

Key Concepts

The average velocity between two points is the **slope of the secant line** which can be found using the following equation :

$$v_{avg} = m_{sec} = \frac{s(t_1) - s(t_0)}{t_1 - t_0}$$

The slope of the tangent line or the **instantaneous velocity** for some $t_0 = a$ is simply the limit as t approaches a as shown below (note here a is a real numerical value... like "5" or "1.769") :

$$m_{tan} = \lim_{t \to a} m_{sec} = \lim_{t \to a} \frac{s(t) - s(a)}{t - a}$$

Definition (Limit of a Function) : Suppose the function f is defined for all x near a except possibly at a. If $f(x)$ is arbitrarily close to L (that is, as close to L as we like) for all x sufficiently close (but not equal) to a, we write

$$\lim_{x \to a} f(x) = L$$

VAs and HAs Key Takeaway : Remember that vertical asymptotes $x = a$ occur when $\lim_{x \to a} f(x) = \pm\infty$, $\lim_{x \to a^-} f(x) = \pm\infty$, or $\lim_{x \to a^+} f(x) = \pm\infty$ while a horizontal asymptote $y = L$ occurs at $\lim_{x \to -\infty} f(x) = L$ or $\lim_{x \to \infty} f(x) = L$

Analyzing infinite limits :

"Because the numerator $\to$ ______ while the denominator $\to 0$ and is $\underline{(+ \text{ or } -)}$ and since $\underline{(\frac{\pm or -}{+ or -} = +or-)}$ then the $\lim_{x \to a} f(x) = +\infty$ or $-\infty$."

Continuity Checklist : A function f will be continuous at a if $\lim_{x \to a} f(x) = f(a)$, which can be expanded to the following checklist which should be followed in order to determine continuity :

1. $f(a)$ is defined (a is in domain of f)
2. $\lim_{x \to a} f(x)$ exists
3. $\lim_{x \to a} f(x) = f(a)$

Intermediate Value Theorem : Suppose f is continuous on the interval $[a, b]$ and L is a number strictly between $f(a)$ and $f(b)$. Then there exists at least one number c in (a, b) satisfying $f(c) = L$

Derivative of a Function at a Point :

1. $f'(a) = \lim_{x \to a} \frac{f(x) - f(a)}{x - a}$
2. $f'(a) = \lim_{h \to 0} \frac{f(a + h) - f(a)}{h}$

Definition of the Derivative :

$$f'(x) = \lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$$

Equation of Tangent Line :

$$y - y(a) = m_{tan}(x - a)$$