MA 2310 Practice Test 1

1 Preliminaries

1. Know the trigonometry we discussed without a calculator (as on the quizzes).

2. Know how to graph basic functions such as: $y = 3x - 1$, $y = 2x^2$, $y = x^3$, $y = \sqrt{x}$, $y = \sin(x)$, $y = \frac{1}{x}$, $y = \frac{1}{x^2}$, $y = e^x$, $y = \ln(x)$, $y = x^{0.57}$ $x^2 + y^2 = 4$ and $y = \cos(x)$.

3. Know how to identify a functions domain.

2 Limits

1. Compute the following limits and show your work.

   (a) $\lim_{x \to 3}$

   (b) $\lim_{x \to 2} \frac{|x-2|}{(x-2)^2}$

   (c) $\lim_{x \to 2} \frac{x^2-8}{|x-2|}$

   (d) $\lim_{x \to 2} \frac{1}{|x-2|}$

   (e) $\lim_{x \to 2} \frac{1}{x-2}$

   (f) $\lim_{x \to \infty} \frac{9x^3-1}{7x^5+5}$

   (g) $\lim_{x \to \infty} \frac{9x^5-1}{7x^3+5}$

   (h) $\lim_{x \to \infty} \frac{9x^5-1}{7x^5+5}$

   (i) $\lim_{x \to \infty} e^{-x}$

   (j) $\lim_{x \to \infty} \ln(x)$

   (k) $\lim_{x \to \infty} \frac{7}{\ln(x)}$

   (l) $\lim_{x \to -\infty} \frac{9x^3-1}{7x^5+5}$

   (m) $\lim_{x \to -\infty} \frac{9x^5-1}{7x^3+5}$

   (n) $\lim_{x \to -\infty} \frac{9x^5-1}{7x^5+5}$

   (o) $\lim_{x \to -\infty} e^{-x}$

   (p) $\lim_{x \to -\infty} \ln(x)$

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

(r) $\lim_{x\to 0} \frac{\cos(3x)}{x^2}$

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

2. For the following functions compute the horizontal and vertical aymptotes.

   (a) $f(x) = \ln(x)$

   (b) $f(x) = \frac{1}{x}$

   (c) $f(x) = \frac{x^2-1}{x+1}$

   (d) $f(x) = \frac{x^2+1}{x+1}$

   (e) $f(x) = \frac{x^2-1}{x^3+1}$ Hint $x^3+1 = (x+1)(\ldots$

   (f) $f(x) = \frac{\sin(x)}{x}$

3. Determine if the function can be made continuous at the point x_0. And if it can find the value c so that the function is continuous at x_0.

   (a) $f(x) = \begin{cases} \frac{\sin(x)}{x} & : x \neq 0 \\ c & : x = 0 \end{cases}$ where $x_0 = 0$.

   (b) $f(x) = \begin{cases} \frac{x^2-1}{x+1} & : x \neq -1 \\ c & : x = -1 \end{cases}$ where $x_0 = -1$.

   (c) $f(x) = \begin{cases} \frac{x^2-4}{x+1} & : x \neq -1 \\ c & : x = -1 \end{cases}$ where $x_0 = -1$.

3 Derivatives

1. Compute the following derivatives from the definition (you must use the definition).

   (a) $f(x) = x^2$

   (b) $f(x) = 3x - 2$

   (c) $f(x) = \frac{1}{x^2}$

   (d) $f(x) = \sqrt{x}$

   (e) $f(x) = \sin(x)$

   (f) $f(x) = \begin{cases} \frac{x^2}{|x|} & : x \neq 0 \\ 0 & : x = 0 \end{cases}$ For this one only compute the derivative at the point $x = 0$.

2. Compute the following derivatives from the rules.

   (a) $f(x) = x^2 - 1 - \frac{1}{x}$

(b) $f(x) = 3x - 2$

(c) $f(x) = x(3x^2 - 2)$

(d) $f(x) = \frac{\sqrt{x}+1}{x}$

(e) $f(x) = \sin(x)$

3. Find the equation of the tangent line at the indicated point $x = a$.

   (a) $f(x) = -3x^2 + 2$; $a = 1$

   (b) $f(x) = e^x$; $a = 0$

   (c) $f(x) = e^x$; $a = 1$

   (d) $f(x) = \sin(x)$; $a = \pi/4$