

MATH 221, EXAM # 1

YOUR NAME

T.A.'s NAME

DISC. SEC. (time)

Show all your work. No calculators or references.

1.(20 pts)
2.(20 pts)
3.(20 pts)
4.(20 pts)
5.(20 pts)
Total

1. Find the limit or state that the limit does not exist.

(a) $\lim_{x \rightarrow 1^+} \frac{x^2 - 1}{|x - 1|}$

(b) $\lim_{h \rightarrow 0} \frac{1 - \cos(h)}{h^2}$

(c) $\lim_{t \rightarrow 0} \frac{\sqrt{t^2 + t + 3} - \sqrt{t^2 + 3}}{t^2}$

2. Find the limit or state that the limit does not exist.

(a) $\lim_{x \rightarrow \infty} \frac{3x^2 + 5x + 2}{x^2 + 2x - 1}$

(b) $\lim_{h \rightarrow 0} \frac{\tan(2h)}{\sin(3h)}$

(c) $\lim_{t \rightarrow 0} \frac{1 - \cos(t)}{\sin(2t)}$

3. Find the points at which the following functions are continuous and discontinuous. Justify your answer.

(a) $f(x) = x + |x - 1|$

(b) $f(x) = \begin{cases} x^2 & x \text{ rational} \\ -x^2 & x \text{ irrational} \end{cases}$

4. Find the equation of the line which is tangent to

$$f(x) = x \sin(1/x) \text{ at } x = 1/\pi .$$

5. Find $f'(x)$ for the following two functions

(a) $f(x) = \sec\left(\frac{x^3 + 4x}{x^2 + 1}\right)$

(b) $f(x) = \cos^3(\tan(x^2))$