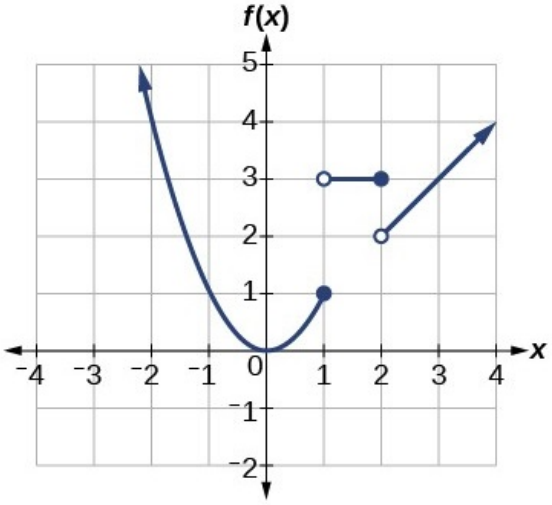
Review for Exam I

MATH 1190

Sections Covered: 1.1, 1.2, 1.3, 1.4, 1.5

This review is provided as a courtesy to give some idea of what material is covered. Nothing else is intended or implied.

(1) Use the graph of $y = f(x)$ shown to answer the following questions.



1. Evaluate if possible $\lim_{x \to 1^-} f(x)$
2. Evaluate if possible $\lim_{x \to 1^+} f(x)$
3. Evaluate if possible $\lim_{x \to 1} f(x)$
4. Evaluate if possible $f(1)$
5. Evaluate if possible $\lim_{x \to 3} f(x)$
6. Evaluate if possible $\lim_{x \to 2^+} f(x)$
7. Is f continuous from the left at 1? (Why/why not?)
8. Is f continuous from the right at 1? (Why/why not?)
9. Does f have a removable discontinuity at 2? (Why/why not?)

(2) Evaluate each limit if possible using limit laws.

(a) $\lim_{x\to 4} \dfrac{x^2-16}{x^2-2x-8}$

(b) $\lim_{t\to 0} \dfrac{e^{3t}}{t+1}$

(c) $\lim_{\theta\to \frac{\pi}{2}} (\cos\theta - \sin\theta)$

(d) $\lim_{x\to 3} \dfrac{\sqrt{4-x}-1}{x-3}$

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

(3) Let $f(x)=\sqrt{x}$. (a) Set up the ratio $\frac{f(x)-f(1)}{x-1}$. Then use limit laws and any necessary algebra to evaluate the limit

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

(4) Determine whether the given function is continuous at the indicated point c . Justify your claims.

(a) $f(x)=\begin{cases} \frac{\sin x}{2x}, & x\neq 0 \\ \frac{1}{2}, & x=0 \end{cases} \qquad c=0$

(b) $f(x)=\begin{cases} (x-1)^2, & x\leq 1 \\ \tan\left(\frac{\pi x}{4}\right), & x>1 \end{cases} \qquad c=1$

(5) Evaluate each limit using appropriate limit statements.

(a) $\lim_{x\to 0} \dfrac{\sin(2x)}{\sin(3x)}$

(b) $\lim_{t\to 0} 2t\csc(4t)$

(c) $\lim_{\theta\to 0} \dfrac{\cos(2\theta)}{\cos(7\theta)}$

(6) Evaluate each limit if possible. If a limit is ∞ or $-\infty$, give the appropriate infinity as the answer. If the limit doesn't exist, just state that it DNE with some justification.

(a) $\lim_{x \to 3^-} \dfrac{1-x}{x-3}$

(b) $\lim_{t \to 0} \dfrac{1}{|t|}$

(c) $\lim_{\theta \to \pi^+} \tan\left(\dfrac{\theta}{2}\right)$

(d) $\lim_{x \to 0} \csc x$

(7) Evaluate each limit at infinity. If it doesn't exist, justify this claim.

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

(b) $\lim_{t \to \infty} \dfrac{3t^3 + 2t^2 + t}{1 - t^3}$

(c) $\lim_{x \to \infty} \sin x$

(8) Use the definition of the derivative to find $f'(2)$ (i.e. set up and evaluate a limit).

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

(b) $f(x) = x^3$

(c) $f(x) = (x-1)^2$