University of Connecticut
Department of Mathematics

Math 1131 Practice for Exam 1 Multiple Choice

Sections Covered: 2.1, 2.2, 2.3, 2.5, 2.6

Read This First!

- These practice problems are NOT sufficient review for the exam and do not represent the exact length of the exam. You should also use other resources, such as the textbook, worksheets, and Paul's Online notes to find further practice problems on topics that you have struggled with (or that you have trouble with on the practice problem set).

- Use these practice problems, in addition to other course materials, as a guide to determine what you need to study more deeply.

- The exam will contain some multiple choice questions as well as short-answer questions. **Short answer questions may be similar to questions found in lecture videos, in-class activities, worksheets, and/or WebAsisgn.** When studying, make sure you are able to **fully justify your answers and reasoning** to prepare for the short-answer portion of the exam.

- The exam will be 50 minutes during your regular discussion section meeting.

- Please read each question carefully. For multiple choice questions, there is only one correct choice for each answer.

- On the exam, please carefully check all of your final answers. The submitted letter answers are the **ONLY** place that counts as your official answers for multiple-choice questions.

- You may **NOT** use a calculator or any other references on the exam, and **you are expected to work independently.**

1. The distance traveled by a particle in t seconds is given by $s(t) = t^2 + 3t$. What is the particle's average velocity over the interval $1 \le t \le 4$? [1]

   (A) 8 (B) 0 (C) 2

   (D) 5 (E) -1

Avg velocity from t=1 to 4 $= \dfrac{s(4) - s(1)}{4-1} = \dfrac{\overset{16+12}{[4^2+3\cdot 4]} - \overset{1+3}{[1^2+3\cdot 1]}}{4-1}$

$= \dfrac{28-(4)}{3} = \dfrac{24}{3} = 8$

$x = .9999 \longrightarrow \dfrac{.9999-3}{.9999-1} = \dfrac{-2.0001}{-.0001} \begin{matrix} \times 10000 \\ \times 10000 \end{matrix}$

$= 20{,}001$

2. Evaluate the following limit: [1]

$$\lim_{x\to 1^-} \frac{x-3}{x-1}. \approx \frac{-2}{\text{small, neg}} \approx +\infty$$

   (A) 2 (B) -2 (C) -1

   (D) $+\infty$ (E) $-\infty$

Aside: $\lim_{x\to 1^+} \dfrac{x-3}{x-1} \approx \dfrac{-2}{\text{small, pos}} \approx -\infty$

so $\lim_{x\to 1} \dfrac{x-3}{x-1}$ DNE.

3. Using the table below, what appears to be the value of the limit [1]

$$\lim_{x\to 2^+} f(x)$$

x	1.9	1.99	1.999	1.9999	2	2.0001	2.001	2.01	2.1
$f(x)$	3	7	291	4081	?	-9532	-112	-17	-1

(A) ∞ (B) $-\infty$ (C) 0

(D) -1000 (E) None of the above.

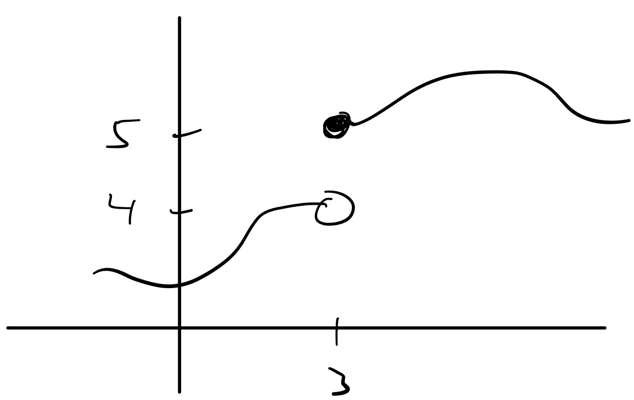
Aside: $\lim_{x\to 2^-} f(x) = +\infty$

and hence $\lim_{x\to 2} f(x)$ DNE.

4. If $\lim_{x\to 3^+} f(x) = 5$ what can be said about $\lim_{x\to 3^-} f(x)$? [1]

(A) It must be 5 (B) It must be $f(3)$ (C) It must be $f(5)$

(D) It must be -5 (E) It cannot be determined



$\lim_{x\to 3} f(x) = f(3)$

$\frac{16-32+16}{4-4} = \frac{0}{0}$ undefined

5. Evaluate the following limit: [1]

$$\lim_{x\to 4} \frac{x^2-8x+16}{x-4}. = \lim_{x\to 4} \frac{(x-4)^{\cancel{2}}}{\cancel{(x-4)}}$$

$$= \lim_{x\to 4} x-4$$

$$= 4-4 = 0$$

(A) 0 (B) 8 (C) -8

(D) $+\infty$ (E) $-\infty$

6. If $\lim_{x\to 1} f(x) = 3$, $\lim_{x\to 1} g(x) = -2$, and $\lim_{x\to 1} h(x) = 4$, evaluate the limit [1]

$$\lim_{x\to 1}\left(\frac{2f(x)}{g(x)} + \sqrt{h(x)}\right) = \frac{\cancel{2}(3)}{(-\cancel{2})} + \sqrt{4}$$

$$= -3+2$$

$$= -1$$

(A) -1 (B) 3 (C) 13

(D) 5 (E) 7

7. If the function $f(x)$ is continuous on the interval $[-1,3]$, $f(-1) = 1$, and $f(3) = 11$, which numbers below are guaranteed to be values of $f(x)$ by the Intermediate Value Theorem on the interval $(-1,3)$? [1]

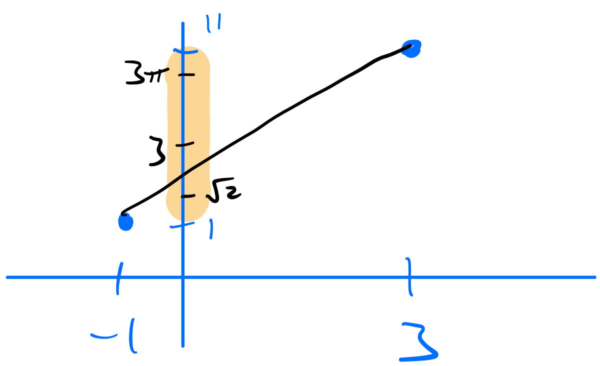
I. 3

II. $\sqrt{2}$ $> \sqrt{1} = 1$

III. 3π $< 3 \cdot 3.2 = 9.6 < 11$

(A) I only (B) II only (C) III only

(D) I and II only (E) I, II, and III



8. Determine the value of the number k that makes the function $f(x)$ below continuous: [1]

$$f(x) = \begin{cases} 1 - kx & \text{if } x < 1, \\ k + x & \text{if } x \geq 1. \end{cases}$$

if $k=0$

$f(x) = \begin{cases} 1, & x<1 \\ x, & x \geq 1 \end{cases}$

(A) 0 (B) 1 (C) $-3/4$

(D) 1/2 (E) 15/17

To be continuous, need $\lim_{x\to 1} f(x) = f(1)$.

In this case, really just need

$$\lim_{x\to 1^-} f(x) = \lim_{x\to 1^+} f(x).$$

$$\lim_{x\to 1^-} 1-kx = \lim_{x\to 1^+} k+x$$

$$1-k(1) = k+(1)$$

$$1-k = k+1$$

$$-1 \quad +k \qquad +k \quad -1$$

$$0 = 2k$$

$$k = 0$$

9. Consider the function [1]

$$h(x) = \begin{cases} \dfrac{1}{x} & \text{if } 0 < x < 1, \\ x & \text{if } x > 1. \end{cases}$$

Which of the following are true?

I. $\lim_{x \to 1^+} h(x)$ exists

II. $\lim_{x \to 1^-} h(x)$ exists

III. $\lim_{x \to 1} h(x)$ exists

IV. $h(x)$ is continuous at $x = 1$

(A) I only (B) I and II only (C) I, II, and III only

(D) IV only (E) I, II, III, and IV

$\lim_{x \to 1^+} h(x) = \lim_{x \to 1^+} x = 1$

$\lim_{x \to 1^-} h(x) = \lim_{x \to 1^-} \frac{1}{x} = 1$

So $\lim_{x \to 1} h(x) = 1$.

But $h(1)$ is undefined,

So $\lim_{x \to 1} h(x) \neq h(1)$.

So not continuous!

10. Evaluate the following limit: [1]

$$\lim_{x \to \infty} \frac{\sqrt{x^2 + 2}}{x} \approx \lim_{x \to \infty} \frac{\sqrt{x^2}}{x} = \lim_{x \to \infty} \frac{|x|}{x}$$

$$= \lim_{x \to \infty} \frac{x}{x} = 1$$

(A) $+\infty$ (B) $-\infty$ (C) 0

(D) 1 (E) -1

Aside: $\lim_{x \to -\infty} \frac{\sqrt{x^2+2}}{x} = \lim_{x \to -\infty} \frac{|x|}{x} = \lim_{x \to -\infty} \frac{-\cancel{x}}{\cancel{x}} = -1$

11. The function $f(x) = \dfrac{x^2+1}{x^3+8}$ has which of the following? [1]

(A) no vertical or horizontal asymptotes

(B) 1 vertical asymptote and 1 horizontal asymptote

(C) 2 vertical asymptotes and 1 horizontal asymptote

(D) 1 vertical asymptote and 2 horizontal asymptotes

(E) 1 vertical asymptote and no horizontal asymptotes

$x^3+8=0$

$x^3=-8$

$x=\sqrt[3]{-8}$

$x=-2.$

Note: $\lim_{x\to -2^+} \frac{x^2+1}{x^3+8} \approx \frac{5}{\text{small, pos}}$

$\hookrightarrow = +\infty$

$\lim_{x\to\pm\infty} \frac{x^2+1}{x^3+8}$

$= \lim_{x\to\pm\infty} \frac{x^2}{x^3} = \lim_{x\to\pm\infty} \frac{1}{x} = 0$

So $y=0$ is a horizontal asymptote

and $x=-2$ is a vertical asymptote.

12. For what value of the number k is the following function differentiable at $x=0$? [1]

$$f(x) = \begin{cases} -x & x \le 0 \\ k & x > 0 \end{cases}$$

(A) -2 (B) -1 (C) 0

(D) 1 (E) No value of k makes this function differentiable at $x=0$

Note: to be continuous, need $\lim_{x\to 0^-} f(x) = \lim_{x\to 0^+} f(x)$

$0 = k$

So $k=0$ and $f(x) = \begin{cases} -x, & x\le 0 \\ 0, & x>0 \end{cases}$

But this is not differentiable: