WRITE ALL YOUR RESPONSES ON YOUR ANSWER SHEETS.
FOR THE **MULTIPLE CHOICE**, **USE ONLY CAPITAL LETTERS**.
FOR THE ITEMS INDICATED AS **SHORT ANSWER**, WRITE YOUR RESULT IN THE BLANK SPACE.
FOR THE ITEMS INDICAED AS **FREE RESPONSE**, SHOW ALL YOUR WORK NEATLY. **USE AS MANY EXTRA SHEETS AS REQUIRED**, AND *DRAW A BOX AROUND* YOUR FINAL ANSWER.

YOU MAY USE A CALCULATOR, YOUR NOTES, AND THE TEXTBOOK.

YOU MUST SUBMIT A PIC OF ALL YOUR **ANSWER SHEETS** NO LATER THAN TODAY AT 4:00pm.
SEND THE PICTURES OF YOUR ANSWER SHEETS AS ATTACHMENTS IN AN EMAIL TO THE ADDRESS:
math2413_1pm_spr_21@yahoo.com

I. MULTIPLE CHOICE: WRITE YOUR RESPONSE IN THE SPACE ON THE ANSWER SHEET.
USE ONLY CAPITAL LETTERS.

1. THE WHEN CONSTRUCTING A DELTA-EPSILON PROOF, THE METHOD DEMONSTRATED IN THE VIDEO LESSONS HAS THREE STEPS. WHAT IS THE SECOND OF THOSE STEPS?
A. VERIFY δ B. LET $\varepsilon > 0$ C. SEARCH FOR δ D. NOT ENOUGH INFORMATION IS GIVEN
E. NONE OF THESE

2. EVALUATING WHICH OF THE FOLLOWING LIMITS WILL REQUIRE MORE WORK THAN "SUBSTITUTE AND SIMPLIFY"?
A. ALL OF THESE B. $\lim_{x\to\pi} \tan(x) =$ C. $\lim_{x\to 3} \frac{(x^2-9)}{(x+3)} =$ D. $\lim_{x\to 2} \frac{(x-2)}{(x^2-4)} =$ E. NONE OF THESE

3. FOR THE FUNCTION $f(x) = \begin{cases} 5-x & \text{if } x<4 \\ 2x-5 & \text{if } x\geq 4 \end{cases}$ WHAT IS THE VALUE OF $\lim_{x\to 4^+} f(x) =$?
A. THE LIMIT DOES NOT EXIST B. 1 C. 3 D. NOT ENOUGH INFORMATION IS GIVEN
E. NONE OF THESE

4. FOR THE LIMIT $\lim_{x\to 2}(-6x-1) = -13$ THE WHEN CONSTRUCTING A DELTA-EPSILON PROOF ACORDING TO THE METHOD DEMONSTRATED IN CLASS, WHAT WOULD BE THE CHOICE FOR DELTA?
A. CHOOSE $\delta = \frac{\varepsilon}{|-13|}$ B. CHOOSE $\delta = \frac{\varepsilon}{-6}$ C. CHOOSE $\delta = \frac{\varepsilon}{|-6|}$ D. CHOOSE $\delta = \frac{\varepsilon}{|2|}$
E. NONE OF THESE

5. HOW MANY (NOT "WHAT ARE THEY", SIMPLY "HOW MANY") DISCONTINUITIES DOES THE FUNCTION $f(x) = \begin{cases} 2x-7 & \text{if } x\leq 5 \\ \frac{-8}{x-7} & \text{if } x>5 \end{cases}$ HAVE?
A. 0 B. 1 C. 3 D. 4 E. NONE OF THESE

6. GIVEN $\lim_{x\to 5} f(x) = 8$. BASED ON THAT ALONE, WHICH OF THE FOLLOWING **MUST** BE TRUE?

A. ALL OF A, B, AND C MUST B E TRUE B. $f(x)$ IS CONTINUOUS AT $x = 5$

C. $f(x)$ IS DISCONTINUOUS AT $x = 5$ D. $\lim_{x\to 5^-} f(x) = 8$ E. NONE OF THESE

7. GIVEN $\lim_{x\to 2} f(x) = 7$. BASED ON THAT ALONE, WHICH OF THE FOLLOWING **MUST** BE TRUE?

A. ALL OF THESE MUST BE TRUE B. $\lim_{x\to 2^+} f(x) = 7$ C. $f(x)$ IS CONTINUOUS AT $x = 2$

D. $f(x)$ IS DISCONTINUOUS AT $x = 2$ E. NONE OF THESE

8. WHEN CONSTRUCTING A DELTA-EPSILON PROOF OF THE LIMIT $\lim_{x\to(-6)} (2x+9) = -3$ ACCORDING TO THE METHOD DEMONSTRATED IN THE VIDEO LESSONS, WHICH LINE IN THE PROOF INDICATES THE REQUIREMENT THAT $x \neq -6$?

A. CHOOSE $\delta = \dfrac{\varepsilon}{|-6|}$ B. $0 < |x-a| < \delta$ C. $|f(x) - L| < \varepsilon$

D. THERE IS NO SUCH INDICATION IN THE PROOF E. NONE OF THESE

9. FOR THE FUNCTION $f(x) = \begin{cases} 1+2x-\tan(2x) & \text{if } x < \pi/2 \\ 2x-\cos(2x) & \text{if } x \geq \pi/2 \end{cases}$ WHAT IS THE VALUE OF $\lim_{x\to \pi/2} f(x) =$?

A. THE LIMIT DOES NOT EXIST B. 1 C. π D. NOT ENOUGH INFORMATION IS GIVEN
E. NONE OF THESE

10. GIVEN THAT $\lim_{x\to 7^+} f(x)$ DOES NOT EXIST, WHAT MUST ALSO BE TRUE?

A. ALL OF B, C, AND D MUST BE TRUE B. $f(7)$ DOES NOT EXIST C. $\lim_{x\to 7^-} f(x)$ DOES NOT EXIST

D. $\lim_{x\to 7} f(x)$ DOES NOT EXIST E. NONE OF THESE

11. WHAT IS THE VALUE OF $\lim_{x\to 9} \dfrac{\sqrt{x+7}-4}{x-9}$

A. 8 B. $1/8$ C. $-1/8$ D. THE LIMIT DOES NOT EXIST E. NONE OF THESE

12. WHAT ARE THE x – VALUES WHERE THE FUNCTION $f(x)$ IS DISCONTINUOUS IF

$$f(x) = \begin{cases} 2 - \dfrac{16}{(x-6)^2} & \text{if } x \leq 4 \\ 2x + \dfrac{10}{(x-5)} & \text{if } x > 4 \end{cases} \quad ?$$

A. $x = 4$ & $x = 5$ & $x = 6$ B. $x = 4$ & $x = 5$ C. $x = 4$ & $x = 6$
D. $x = 5$ & $x = 6$ E. NONE OF THESE

13. WHAT ARE THE x – VALUES WHERE THE FUNCTION $f(x)=\sec(x)-\tan(x)$ IS DISCONTINUOUS?

A. ALL x – VALUES SUCH THAT $x=(2k+1)\cdot\pi$ B. ALL x – VALUES SUCH THAT $x=2k\cdot\pi$

C. ALL x – VALUES SUCH THAT $x=(2k+1)\cdot\pi/2$ D. NOT ENOUGH INFORMATION IS GIVEN

E. NONE OF THESE

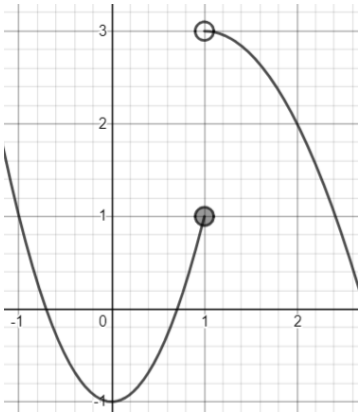
14. GIVEN $f(x)$ IS CONTINUOUS AT $x=-3$. BASED ON THAT ALONE, WHICH OF THE FOLLOWING **MUST** BE TRUE?

A. ALL OF A, B, AND C MUST B E TRUE B. $f(x)$ IS DEFINED AT $x=-3$

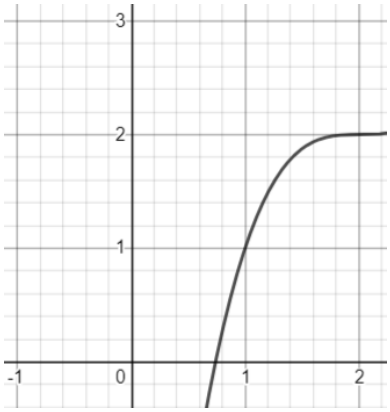
C. $\lim_{x\to(-3)} f(x)$ EXISTS D. $\lim_{x\to(-3)^-} f(x) = \lim_{x\to(-3)^+} f(x)$ E. NONE OF THESE

15. WHICH OF THE FOLLOWING GRAPHS INDICATES THAT $\lim_{x\to1^+} f(x)$ DOES NOT EXIST

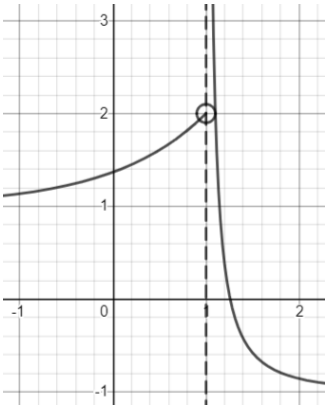
A.



B.



C.



D. $\lim_{x\to1^+} f(x)$ DOES NOT EXIST FOR ALL OF THESE E. NONE OF THESE

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II. SHORT ANSWER. WRITE OUT YOUR RESPONSE IN THE BLANK ON THE ANSWER SHEET. FOR THIS SECTION YOU DO NOT NEED TO SHOW YOUR WORK OR ATTACH ANY SHEETS SHOWING YOUR WORK. SIMPLY WRITE YOUR FINAL RESULTS ON THE ANSWER SHEET.

16. FIND ALL THE x-VALUES WHERE THE FUNCTION

$$f(x)=\begin{cases}\dfrac{-3}{x^2-4}, & x\le 1\\ -x^2+2 & x>1\end{cases}$$ IS NOT CONTINUOUS ON THE INTERVAL $(-\infty,\infty)$

WRITE YOUR FINAL RESULT(S) ON THE ANSWER SHEET.

17. DETERMINE THE VALUE OF k WHICH WILL MAKE THE FUNCTION CONTINUOUS.

$$f(x)=\begin{cases}x^2-k\,x & if \quad x<-2\\ 4x+2 & if \quad x\ge -2\end{cases}$$

WRITE YOUR FINAL RESULT ON THE ANSWER SHEET.

18. EVALUATE THE LIMIT:

$$\lim_{\Delta x \to 0} \frac{\left(x+\Delta x\right)^2 - 3\left(x+\Delta x\right) + 2 - \left(x^2 - 3x + 2\right)}{\Delta x}$$

WRITE YOUR FINAL RESULT ON THE ANSWER SHEET.

19. EVALUATE THE LIMIT:

$$\lim_{x \to 3} \frac{\left(\sqrt{x+1} - 2\right)}{(x-3)}$$

WRITE YOUR FINAL RESULT(S) ON THE ANSWER SHEET.

20. FIND **ALL** THE x-VALUES WHERE THE FUNCTION

$$f(x) = \begin{cases} -\cos(x), & x \le 0 \\ \tan(x), & x > 0 \end{cases}$$ IS NOT CONTINUOUS ON THE INTERVAL $\left(-2\pi, 2\pi\right)$.

WRITE YOUR FINAL RESULT(S) ON THE ANSWER SHEET.

III. FREE RESPONSE: FOR EACH OF THE FOLLOWING ITEMS YOU MUST SHOW YOUR WORK NEATLY AND COMPLETELY AS DEMONSTRATED IN THE VIDEO LESSONS. YOU **DO NOT NEED TO SIMPLIFY** YOUR FINAL RESULT IN ANY WAY, HOWEVER, *DRAW A BOX AROUND* YOUR FINAL ANSWER.
USE AS MANY EXTRA SHEETS AS NEEDED. YOUR WORK MUST BE NEAT, READABLE, AND USE ONLY METHODS DISCUSSED ON THE VIDEO LESSONS.
IF YOU DO NOT SHOW ALL YOUR WORK IN A NEAT AND ORDERLY FASHION, OR IF YOU USE METHODS OTHER THAN THOSE DISCUSSED ON THE VIDEO LESSONS, OR IF YOU DO NOT FOLLOW DIRECTIONS, YOU FORFEIT YOUR CLAIM TO ANY CREDIT.

21. EVALUATE THE LIMIT:

$$\lim_{x \to 4} \frac{x^2 - 6x + 8}{x^2 - x - 12}$$

22. EVALUATE THE LIMIT:

$$\lim_{x \to 0} \frac{2\tan(3x)}{x}$$

23. EVALUATE THE LIMIT:

$$\lim_{x \to 9} \frac{\left(\sqrt{18-x} - \sqrt{x}\right)}{(9-x)}$$

24. EVALUATE THE LIMIT:

$$\lim_{x \to (-1)} f(x) \quad \text{WHERE} \quad f(x) = \begin{cases} 4x - x^2, & x \le -1 \\ \dfrac{15}{x+4}, & x > -1 \end{cases}$$

25. EVALUATE THE LIMIT:

$$\lim_{x \to 5} \frac{3-x}{x-5}$$

26. USING A $\delta - \varepsilon$ PROOF, PROVE THE FOLLOWING STATEMENT.

$$\lim_{x \to (-3)} (-5x - 6) = 9$$

WHEN YOU ARE FINISHED, **PRINT NEATLY** THE FOLLOWING STATEMENT AT THE BOTTOM OF THE LAST OF YOUR ANSWER SHEETS THEN **SIGN YOUR NAME**:

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED IMPROPER ASSISTANCE ON THIS EXAM.