WRITE ALL YOUR RESPONSES ON YOUR ANSWER SHEETS.
A) FOR THE **MULTIPLE CHOICE** ITEMS, YOU DO NOT NEED TO SHOW YOUR WORK, **USE ONLY
    CAPITAL LETTERS** AND YOU DO NOT NEED TO PUT A BOX AROUNDF YOUR FINAL RESULT.
B) FOR THE **FREE RESPONSE** ITEMS, SHOW **ALL** YOUR WORK NEATLY.
    USE AS MANY EXTRA SHEETS AS REQUIRED, AND $\boxed{DRAW\ A\ BOX\ AROUND}$ YOUR
    FINAL ANSWER.
C) YOU MAY USE A CALCULATOR, YOUR NOTES, AND THE TEXTBOOK.

YOU MUST SUBMIT PICTURES OF ALL YOUR **ANSWER SHEETS** NO LATER THAN 1:15pm HOUSTON
TIME TODAY. SEND THE PICTURES OF YOUR ANSWER SHEETS AS ATTACHMENTS IN AN EMAIL TO
THE ADDRESS:

<div align="center">egleymath2413.1101mon@yahoo.com</div>

THERE ARE THIRTY-TWO (32) TOTAL ITEMS ON THE EXAM.

*****

I. MULTIPLE CHOICE.

1. FOR THE FUNCTION $f(x) = \begin{cases} 5 - x & if\ x < 4 \\ 2x - 5 & if\ x \geq 4 \end{cases}$ WHAT IS THE VALUE OF $\lim\limits_{x \to 4^+} f(x) =$?

A. THE LIMIT DOES NOT EXIST   B. 3   C. 1   D. NOT ENOUGH INFORMATION IS GIVEN
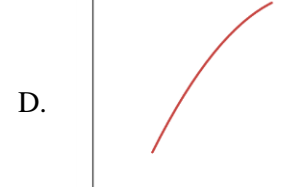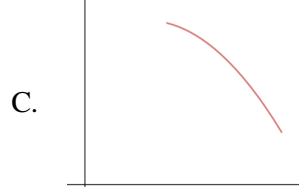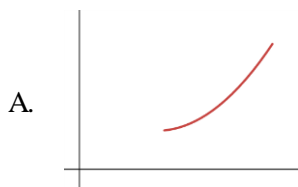E. NONE OF THESE

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

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

3. WHAT IS THE VALUE OF $\lim\limits_{x \to 9} \dfrac{\sqrt{x+7} - 4}{x - 9}$

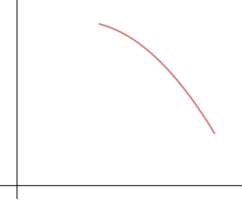A. THE LIMIT DOES NOT EXIST   B. 8   C. $\dfrac{1}{8}$ D. $-\dfrac{1}{8}$ E. NONE OF THESE

4. ASSUME $f(x)$ IS CONTINUOUS AND DIFFERENTIABLE ON AN OPEN INTERVAL AS GRAPHED.
WHICH OF THESE GRAPHS HAS $f'(x) > 0$ AND $f''(x) < 0$ ON THE **ENTIRE INTERVAL**?
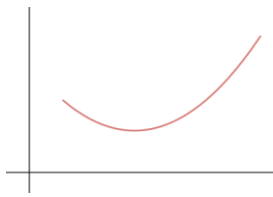

A.   B.   C.   D.

E. NONE OF THESE

5. ASSUME $f(x)$ IS CONTINUOUS AND DIFFERENTIABLE ON AN OPEN INTERVAL AS GRAPHED. WHICH OF THESE GRAPHS HAS $f'(x) < 0$ AND $f''(x) > 0$ ON THE **ENTIRE INTERVAL**?
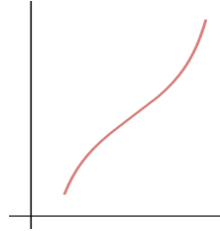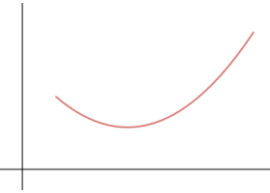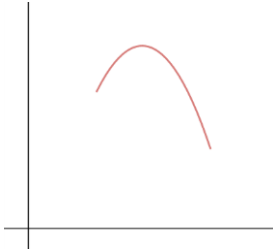
A.

B.

C.

D.

E. NONE OF THESE

6. ASSUME $f(x)$ IS CONTINUOUS AND DIFFERENTIABLE ON AN OPEN INTERVAL AS GRAPHED. WHICH OF THESE GRAPHS HAS $f''(x) > 0$ ON THE **ENTIRE INTERVAL**?

A.

B.

C.

D.

E. NONE OF THESE

7. FOR THIS FUNCTION WHICH OF THE FOLLOWING MUST TRUE FOR THE **ENTIRE INTERVAL** BEING GRAPHED?

A. $f'(x) > 0$ AND $f''(x) < 0$ B. $f'(x) < 0$ AND $f''(x) > 0$ C. $f'(x) > 0$ AND $f''(x) > 0$
D. $f'(x) < 0$ AND $f''(x) < 0$ E. NONE OF THESE

8. FOR THIS FUNCTION WHICH OF THE FOLLOWING MUST TRUE FOR THE **ENTIRE INTERVAL** BEING GRAPHED?

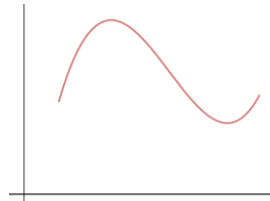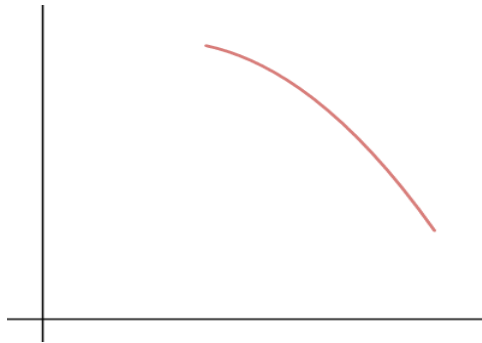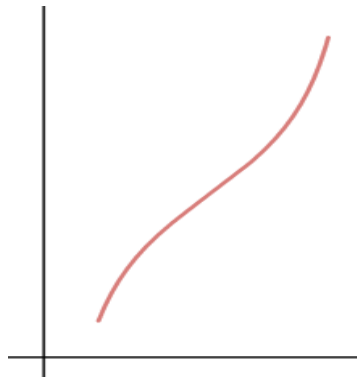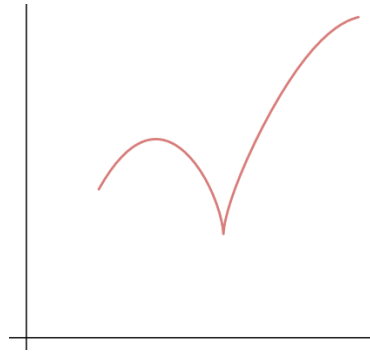A. $f''(x) > 0$ B. $f'(x) > 0$ C. $f'(x) < 0$ D. $f''(x) < 0$ E. NONE OF THESE

9. FOR THIS FUNCTION WHICH OF THE FOLLOWING MUST TRUE FOR THE **ENTIRE INTERVAL** BEING GRAPHED?

A. ALL OF B, C, AND D ARE TRUE

B. $f(x)$ IS DIFFERENTIABLE ON THE ENTIRE INTERVAL

C. $f(x)$ IS CONTINUOUS ON THE ENTIRE INTERVAL

D. $f'(x)$ IS DEFINED ON THE ENTIRE INTERVAL   E. NONE OF THESE

10. THE SLOPE OF THE TANGENT LINE OF THE FUNCTION $f(x) = -\sin(x) + Mx$ EQUALS 5 (FIVE) WHEN $x = 0$. WHAT VALUE OF M WILL CAUSE THAT TO OCCUR?

A. $M = 0$ B. $M = 6$ C. $M = 4$ D. THERE IS NO SUCH VALUE FOR M E. NONE OF THESE

11. GIVEN $\int_0^2 \left(6x^2 + 4Mx - 1\right) dx = 6$.   WHAT MUST BE THE VALUE FOR M ?

A. $B = 3$ B. $B = 1$ C. $B = 7$

D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

12. GIVEN THE FUNCTION $f(x) = e^{(2x)} - x^2$ WHAT IS THE VALUE OF $f''(2)$?

A. e^2 B. e^{4x} C. $2e^2$

D. THERE IS NO SUCH VALUE OF M   E. NONE OF THESE

13. GIVEN THE FUNCTION $f(x) = 6\ln(x) - Mx^2$ AND THAT $f'(2) = 11$,

WHAT MUST BE THE VALUE FOR M ?

A. $M = -1$ B. $M = 2$ C. $M = 3$

D. THERE IS NO SUCH VALUE OF M   E. NONE OF THESE

* * * * *

II. A FIRST DERIVATIVE ANALYSIS IS BEING CONDUCTED AND THE FOLLOWING RESULTS ARE OBTAINED. ASSUME THE FUNCTION IS A POLYNOMAL USE THE GIVEN DIAGRAM TO ANSWER QUESTIONS #14 THRU #18 .

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       ↘           ↘            ↗          ↘
  ———————+———————————+————————————+—————————————
        -6          -1           3
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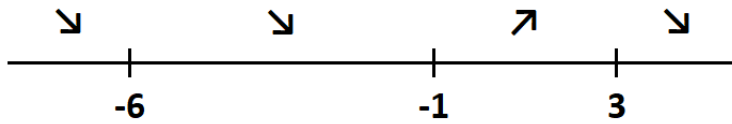
14. FOR WHICH INTERVAL IS $f'(x) > 0$?

A. $(-\infty, -6)$ B. $(-6, -1)$ C. $(-1, 3)$ D. $(3, \infty)$ E. NONE OF THESE

15. WHAT <u>MUST</u> OCCUR AT $x = 3$?

A. A RELATIVE MINIMUM   B. AN ABSOLUTE MINIMUM   C. A RELATIVE MAXIMUM
D. AN ABSOLUTE MAXIMUM   E. NONE OF THESE

16. WHERE IS THERE A RELATIVE MINIMUM?

A. $x = -6$ B. $x = -1$ C. $x = 3$ D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

17. WHERE IS THERE AN ABSOLUTE MINIMUM?

A. $x = -6$ B. $x = -1$ C. $x = 3$ D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

18. WHERE IS AN INFLECTION POINT LOCATED?

A. $x = -6$ B. $x = -1$ C. $x = 3$
D. THIS MAY NOT BE DETERMINED FROM THE GIVEN INFORMATION   E. NONE OF THESE

* * * * *

IIII. A SECOND DERIVATIVE ANALYSIS IS BEING CONDUCTED AND THE FOLLOWING RESULTS ARE OBTAINED. ASSUME THE FUNCTION IS A POLYNOMAL. USE THE GIVEN DIAGRAM TO ANSWER QUESTIONS #19   THRU #23.

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      U          ∩           ∩        U         U
 ———————+—————————+———————————+————————+————+————————
       -6        -1          2        4
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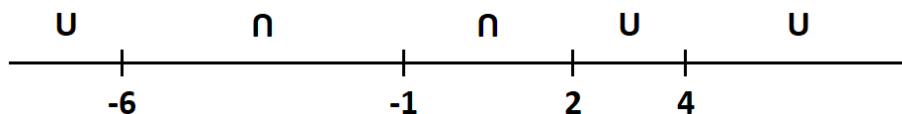
19. ON WHICH OF THESE INTERVALS IS $f''(x) > 0$?

A. $(-\infty, -1)$ B. $(-6, -1)$ C. $(4, \infty)$ D. ALL OF THESE   E. NONE OF THESE

20. WHICH OF THESE **MUST** BE THE LOCATION OF AN INFLECTION POINT?

A. $x = -6$ AND $x = -1$ B. $x = -6$ AND $x = 2$ C. $x = -1$ AND $x = 4$
D. THERE ARE NO INFLECTION POINTS   E. NONE OF THESE

21. ON WHICH OF THESE INTERVALS IS $f(x)$ CONCAVE DOWN?

A. $(-\infty, -6)$ B. $(-1, 2)$ C. $(4, \infty)$ D. $(-\infty, \infty)$ E. NONE OF THESE

22. WHAT MUST BE TRUE ABOUT $f''(1)$?

A. $f''(1) > 0$ B. $f''(1) < 0$ C. $f''(1)$ IS UNDEFINED   D. $f''(1) = 0$
E. NONE OF THESE

23. HOW MANY INFLECTION POINTS DOES THE FUNCTION HAVE?

A. 1   B. 2   C. 3   D. 4   E. NONE OF THESE

24. IF THE INTEGRAL $\int_{0}^{\pi}(6x^2)\sec^2(x^3-2)dx$ IS EVALUATED USING A $u-$SUBSTITUTION, WHAT WOULD THE "LET" STATEMENT BE?

A. LET $u=6x^2$ B. LET $u=\sec(x^3-2)$ C. LET $u=\sec(x)$

D. LET $u=x^3-2$ E. NONE OF THESE

25. WHAT IS THE EQUATION OF THE LINE TANGENT TO THE GRAPH OF $f(x)=\ln(x)-2x$ WHEN $x=1$?

A. $y=-x-1$ B. $y=-x+3$ C. $y=x-3$ D. $y=x-1$ E. NONE OF THESE

26. WHICH OF THESE IS THE 2ND DERIVATIVE OF THE FUNCTION $f(x)=\ln(e^x-1)$?

A. $f''(x)=\dfrac{e^x}{(e^x-1)^2}$ B. $f''(x)=\dfrac{(e^x-1)(e^x)-(e^x)(e^x)}{(e^x-1)}$

C. $f''(x)=\dfrac{(e^x-1)(e^x)-(e^x)(e^x)}{(e^x-1)^2}$ D. $f''(x)=\dfrac{e^x}{(e^x-1)}$ E. NONE OF THESE

27. GIVEN THAT $\int_{0}^{2}\left(12x^2+2Mx-4\right)dx=20$ WHAT MUST BE THE VALUE FOR M?

A. $M=-5$ B. $M=5$ C. $M=-3$ D. M CANNOT BE DETERMINED
E. NONE OF THESE

28. WHICH OF THESE IS THE VALUE OF THE DERIVATIVE: $\displaystyle\int\frac{6}{\sqrt{4-9x^2}}\,dx$

A. $\sec^{-1}\left(\dfrac{|3x|}{2}\right)+C$ B. $\dfrac{1}{2}\sin^{-1}\left(\dfrac{3x}{2}\right)+C$ C. $\sin^{-1}(3x)+C$

D. THIS INTEGRAL CANNOT BE EVALUATED   E. NONE OF THESE

29. WHAT IS THE VALUE OF THE EXPRESSION: $\dfrac{d}{dx}\left[\int(e^x+1)dx\right]$?

   HINT: WORK FROM THE INSIDE OUT.

A. e^x+Cx B. e^x C. e^x+1 D. e^x+1+C E. NONE OF THESE

II. **FREE RESPONSE**: FOR EACH OF THE FOLLOWING ITEMS YOU MUST SHOW YOUR WORK
NEATLY AND COMPLETELY AS DEMONSTRATED IN THE VIDEO LESSONS.
$\boxed{DRAW\ A\ BOX\ AROUND}$ YOUR FINAL ANSWER.
USE AS MANY EXTRA SHEETS AS NEEDED. YOUR WORK MUST BE NEAT, READABLE, AND YOU MAY
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.

30. (SHORT ANSWER) A BUILDER WISHES TO FENCE IN SEVERAL PENS AGAINT A BARN. AS
INDICATED IN THE PICTURE, THERE ARE THREE RECTANGULAR AND TWO SQUARE PENS. FENCE IS
REQUIRED ONLY WHERE THE BLACK LINES ARE INDICATED. SIDES ALONG THE BARN DO NOT
REQUIRE ANY FENCE. THERE ARE 320 FEET OF FENCE AVAILABLE AND THE BUILDER WISHES TO
MAXIMIZE THE TOTAL AREA ENCLOSED. WHAT ARE THE VALUES OF x AND y WHICH WILL GIVE
THE MAXIMUM AREA?
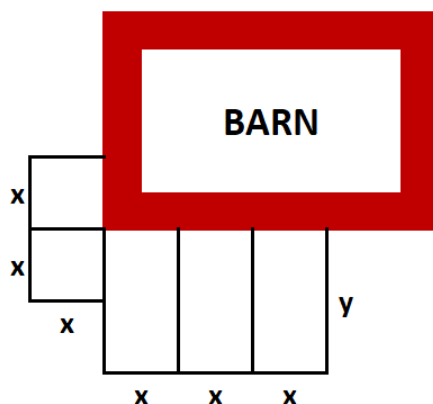
31. AT A QUARRY, SAND IS FALLING ONTO A PILE FORMING A CONE. THE CONSISTENCY OF THE SAND
IS SUCH THAT THE BASE RADIUS OF THE PILE IS ALWAYS 3 TIMES THE HEIGHT. ASSUMING THE
HEIGHT IS INCREASING AT THE RATE OF $1\,{}^{m}\!/_{\text{sec}}$, WHAT IS THE RATE OF CHANGE OF THE VOLUME
WHEN RADIUS IS $12m$?

32. EVALUATE THE DEFINITE INTEGRAL. YOU MUST NEATLY SHOW ALL STEPS OF ALL YOUR WORK
IN ORDER TO RECEIVE FULL CREDIT FOR YOUR WORK. DO NOT SIMPLIFY YOUR FINAL RESULT IN ANY
WAY. IF YOU DO NOT SHOW ALL YOUR WORK NEATLY YOU FORFEIT YOUR CLAIM TO ANY CREDIT.

$\int_{-1}^{0} 4xe^{(1-x^2)}\,dx$

AFTER YOU FINISH, BE SURE TO PRINT THE FOLLOWING AT THE BOTTOM OF YOUR ANSWER SHEET,
PRINT YOUR NAME, AND SIGN YOUR NAME.

On my honor, I have neither given nor received improper assistance on this exam.