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 **SHORT ANSWER** ITEMS, YOU DO NOT NEED TO SHOW YOUR WORK, AND YOU DO NOT
    NEED TO PUT A BOX AROUNDF YOUR FINAL RESULT.

C) 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.

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

YOU MUST SUBMIT PICTURES OF ALL YOUR **ANSWER SHEETS** NO LATER THAN 1:30pm 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>

NOTE: I WILL BE LESS FORGIVING OF LATE SUBMISSIONS THAN I WAS ON EXAM I.
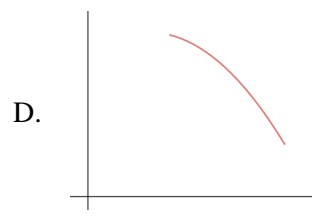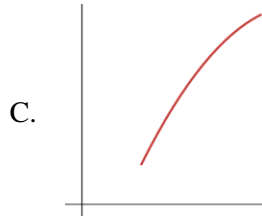
THERE ARE THIRTY-SEVEN (37) TOTAL ITEMS ON THE EXAM.

1. 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.
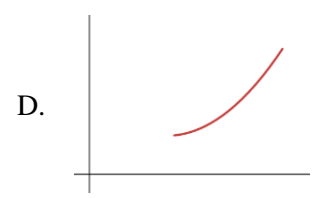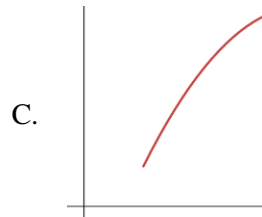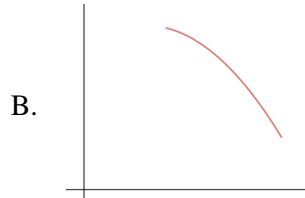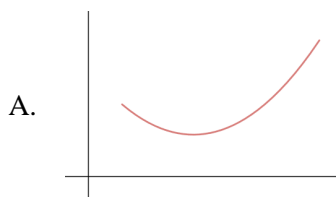
E. NONE OF THESE

2. 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.
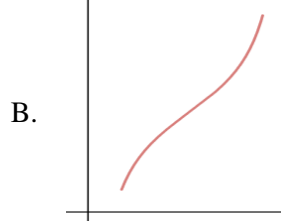
E. NONE OF THESE

3. 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.
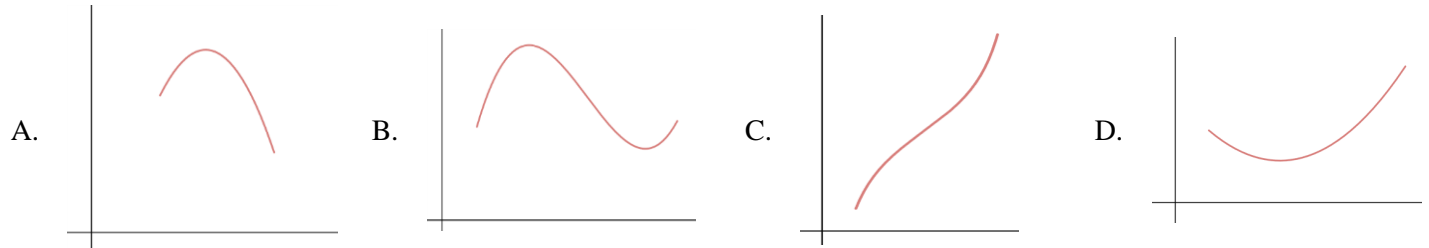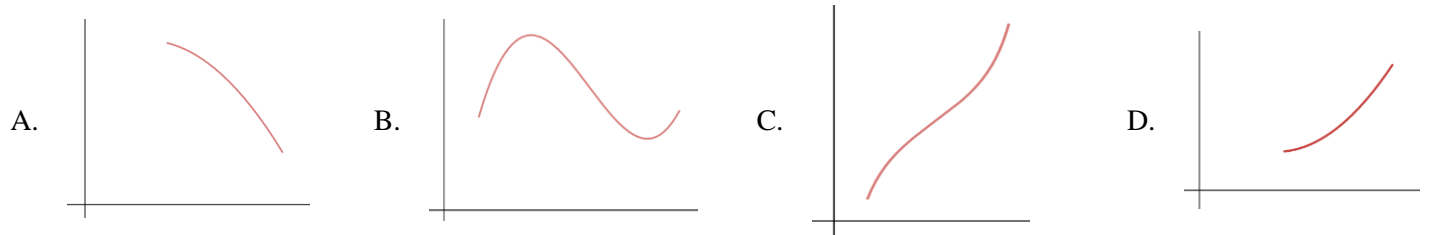
E. NONE OF THESE

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. FOR THIS FUNCTION WHICH OF THE FOLLOWING MUST TRUE FOR THE **ENTIRE INTERVAL** BEING GRAPHED?
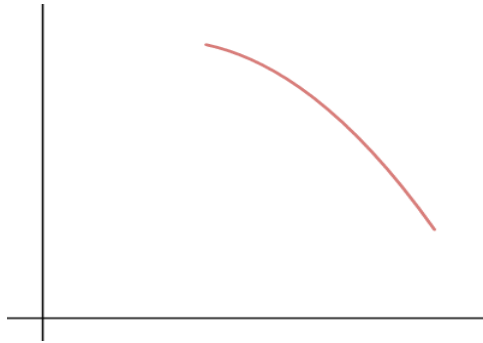
A. $f'(x) > 0$ AND $f''(x) > 0$ B. $f'(x) < 0$ AND $f''(x) < 0$ C. $f'(x) > 0$ AND $f''(x) < 0$
D. $f'(x) < 0$ AND $f''(x) > 0$ E. NONE OF THESE

6. 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

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

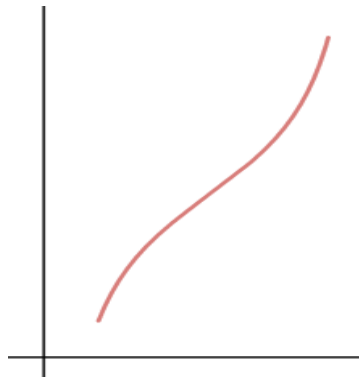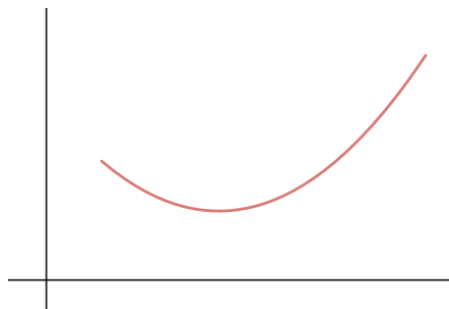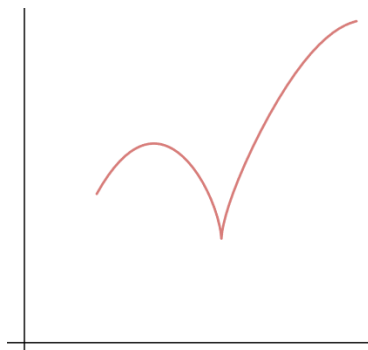A. $f'(x) > 0$ B. $f'(x) < 0$ C. $f''(x) < 0$ D. $f''(x) > 0$ E. NONE OF THESE

8. 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

* * * * *

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 #9 THRU #12** .
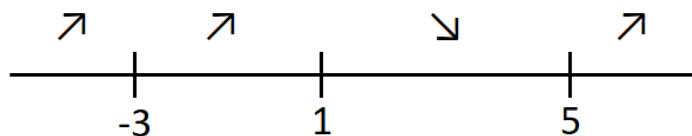
9. FOR WHICH OF THE FOLLOWING INTERVALS IS $f'(x) < 0$?

A. $(-\infty, -3)$ B. $(-3, 1)$ C. $(1, 5)$ D. $(5, \infty)$ E. NONE OF THESE

10. WHERE IS THERE A SADDLE POINT?

A. B, C, AND D ARE ALL CORRECT   B. $x = -3$ C. $x = 1$ D. $x = 5$ E. NONE OF THESE

11. WHERE IS THERE A RELATIVE MINIMUM?

A. $x = -3$ B. $x = 1$ C. $x = 5$ D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

12. WHERE IS THERE AN ABSOLUTE MAXIMUM?

A. $x = -3$ B. $x = 1$ C. $x = 5$ D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

* * * * *

13. WHAT IS THE ABSOLUTE MINIMUM VALUE ACHIEVED BY THE FUNCTION $f(x) = x^3 - 9x^2 + 45$

A. $y = 1$ B. $y = 45$ C. $y = -35$ D. $y = -63$ E. NONE OF THESE

14. THE SLOPE OF THE TANGENT LINE OF THE FUNCTION $f(x) = -\tan(x) + Bx$ EQUALS 1 (ONE) WHEN $x = 0$. WHAT VALUE OF B WILL CAUSE THAT TO OCCUR?

A. $B = 2$ B. $B = 1$ C. $B = 0$ D. THERE IS NO SUCH VALUE FOR B E. NONE OF THESE

* * * * *

III.   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 #15 THRU #18** .
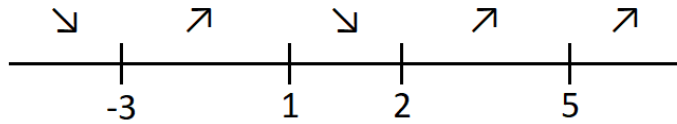
15. WHERE IS THERE A RELATIVE MAXIMUM?

A. $x = -3$ B. $x = 1$ C. $x = 2$ D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

16. WHERE IS THERE AN ABSOLUTE MINIMUM?

A. $x = -3$ B. $x = 1$ C. $x = 2$ D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

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

A. $f''(-1) > 0$ B. $f''(-1) < 0$ C. $f''(-1)$ IS UNDEFINED   D. $f''(-1) = f''(3)$
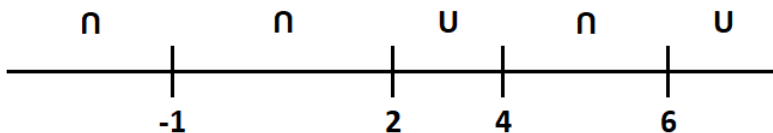
E. NONE OF THESE

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

A. $f'(-1) > 0$ B. $f'(-1) < 0$ C. $f'(-1)$ IS UNDEFINED   D. $f'(-1) = f'(3)$

E. NONE OF THESE

19. FOR THE FUNCTION $f(x) = 3x^3 + 3Bx^2 - 7$ AT THE POINT $x = -2$, WHAT VALUES OF B WILL CAUSE $f(x)$ TO BE INCREASING?

A. $B > -3$ B. $B < -3$ C. $B > 3$ D. $B < 3$ 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 #20 THRU #26** .

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

A. $x = -1$ AND $x = 2$ B. $x = 2$ AND $x = 6$ C. $x = -1$ AND $x = 4$

D. THERE ARE NO INFLECTION POINTS   E. NONE OF THESE

21. ON WHICH INTERVAL MUST $f(x)$ BE CONCAVE UP?

A. $(-\infty, -1)$ B. $(-1, 2)$ C. $(4, 6)$ D. $(6, \infty)$ 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. ON WHICH INTERVAL IS $f''(x) > 0$?
A. $(-\infty, -1)$ B. $(-1, 2)$ C. $(4, 6)$ D. ALL OF THESE   E. NONE OF THESE

25. ON WHICH INTERVAL IS MUST $f(x)$ BE CONCAVE DOWN?
A. B, C, AND D ARE ALL CORRECT   B. $(-\infty, -1)$ C. $(-1, 2)$ D. $(4, 6)$ E. NONE OF THESE

26. WHERE IS A RELATIVE MINIMUM LOCATED?
A. $x = -1$ B. $x = 2$ C. $x = 4$
D. THIS MAY NOT BE DETERMINED FROM THE GIVEN INFORMATION   E. NONE OF THESE

* * * * *

27. WHICH OF THE FOLLOWING IS CORRECT?
A. IF THERE IS A CUSP AT $x = c$, THERE **MIGHT** ALSO BE A RELATIVE EXTREMUM THERE
B. IF THERE IS A CUSP AT $x = c$, THERE **CANNOT** ALSO BE A RELATIVE EXTREMUM THERE
C. IF THERE IS A CUSP AT $x = c$, THERE **MUST** ALSO BE A RELATIVE EXTREMUM THERE
D. ALL OF THESE ARE CORRECT   E. NONE OF THESE

28. WHICH OF THE FOLLOWING IS CORRECT?
A. IF THERE IS A RELATIVE EXTREMUM AT $f(c)$, THEN $f'(c)$ **MIGHT** EQUAL ZERO
B. IF THERE IS A RELATIVE EXTREMUM AT $f(c)$, THEN $f'(c)$ **CANNOT** EQUAL ZERO
C. IF THERE IS A RELATIVE EXTREMUM AT $f(c)$, THEN $f'(c)$ **MUST** EQUAL ZERO
D. ALL OF THESE ARE CORRECT   E. NONE OF THESE

29. WHICH OF THE FOLLOWING IS CORRECT?
A. IF THERE IS A VERTICAL ASYMPTOTE AT $x = c$, THERE **MIGHT** ALSO BE A CUSP THERE
B. IF THERE IS A VERTICAL ASYMPTOTE AT $x = c$, THERE **CANNOT** ALSO BE A CUSP THERE
C. IF THERE IS A VERTICAL ASYMPTOTE AT $x = c$, THERE **MUST** ALSO BE A CUSP THERE
D. ALL OF THESE ARE CORRECT   E. NONE OF THESE

30. WHICH OF THE FOLLOWING IS CORRECT?
A. IF THERE IS A RELATIVE MAXIMUM AT $x = c$, THERE MIGHT ALSO BE A RELATIVE MINIMUM THERE
B. IF THERE IS AN INFLECTION POINT AT $x = c$, THERE MIGHT ALSO BE A VERTICAL ASYMPTOTE THERE
C. IF $f'(x) = 0$ AT $x = c$, THEN THERE MIGHT BE A SADDLE POINT THERE
D. ALL OF THESE ARE CORRECT   E. NONE OF THESE

31. GIVEN THE FUNCTION $f(x) = \dfrac{x^2 + Bx}{x^2 + 1}$ AND THAT $f'(0) = 2$, WHAT MUST BE THE VALUE FOR B ?

A. $B = 1$ B. $B = 7$ C. $B = 3$
D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

32. GIVEN THE FUNCTION $f(x) = \tan(x) - Bx^2$ AND THAT $f''(0) = 6$,
WHAT MUST BE THE VALUE FOR B ?
A. $B = -3$ B. $B = 0$ C. $B = 3$
D. NOT ENOUGH INFORMATION IS GIVEN   E. NONE OF THESE

33. IF $\lim\limits_{x\to\infty} f(x) = -3$ WHAT MUST BE TRUE

A. $f(x)$ IS UNDEFINED AT $x = -3$ B. $f(x)$ HAS A VERTICAL ASYMPTOTE AT $x = -3$

C. B. $f(x)$ HAS A HORIZONTAL ASYMPTOTE AT $y = -3$ D. $y = -3$ IN NOT IN THE RANGE OF $f(x)$

E. NONE OF THESE

34. SUPPOSE THE LIMIT $\lim\limits_{x\to\infty} \dfrac{x^5 + x}{x^B - 1} = \infty$. WHAT MUST BE THE VALUE FOR B?

A. $B < 5$ B. $B = 5$ C. $B > 5$ D. THERE IS NO SUCH VALUE FOR B E. NONE OF THESE

35. (SHORT ANSWER) SUPPOSE THE LIMIT $\lim\limits_{x\to\infty} \dfrac{Bx^3 - Bx}{-2x^3 + B} = -4$. WHAT MUST BE THE VALUE FOR B?


II. 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,
$\boxed{DRAW\ A\ BOX\ AROUND}$ 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.

36. A BUILDER WISHES TO ENCLOSE A REGION WITH
FENCE. THERE ARE 160 METERS OF FENCE AVAILABLE.
THE LAYOUT MUST BE AS INDICATED, WITH FENCE
INDICATED BY THE SOLID LINES. ASSUMING THE
BUILDER WANTS TO ENCLOSE THE MAXIMUM
SURFACE AREA POSSIBLE, WHAT MUST BE THE
LENGTH OF THE SEGMENTS INDICATED BY THE VALUE
'x' ?
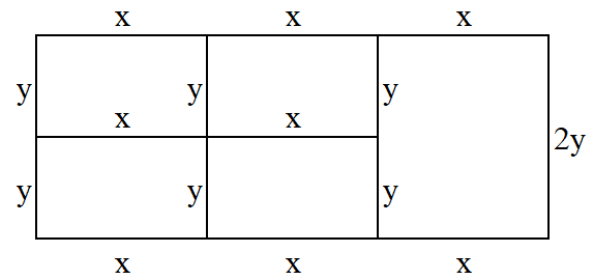
37. A FARMER WISHES TO CONSTRUCT A GROUP
OF HOLDING PENS AGAINST THE SIDE OF A
BARN AS INDICATED IN THE DIAGRAM. THERE
ARE TO BE FOUR LONGER PENS, AND TWO
SMALLER SQUARE PENS ATTACHED TO THE
SIDES. IF THERE IS 200 FEET OF FENCE
AVAILABLE TO USE, FIND THE LENGTHS OF X
(BLUE) AND Y (BLACK) WHICH WILL ENCLOSE
THE MAXIMUM TOTAL SURFACE AREA OF THE
TWO SQUARE PENS PLUS THE FOUR LONGER
ONES.
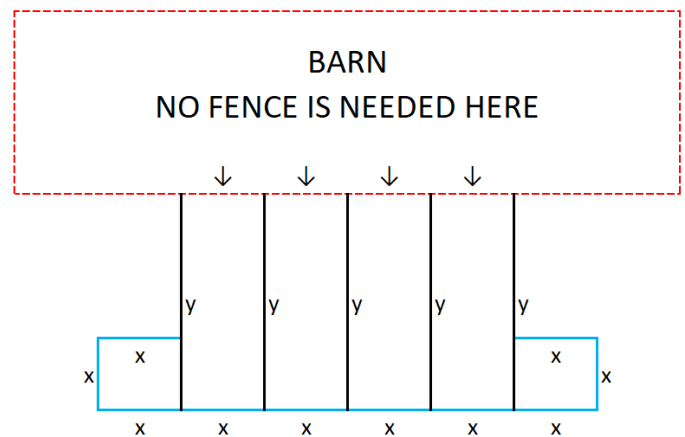
AFTER YOU FINISH, BE SURE TO PRINT THE FOLLOWING AT THE BOTTOM OF YOUR ANSWER SHEET,
PRINT YOUR NAME, AND SIGN YOUR NAME.

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