MAC 2233
Fall 2019

EXAM 3A

A. Sign your bubble sheet on the back at the bottom in ink.

B. In pencil, write and encode in the spaces indicated:

1) Name (last name, first initial, middle initial)
2) UF ID Number
3) Section Number

C. Under "special codes", code in the test ID number 3, 1.

1 2 ● 4 5 6 7 8 9 0
● 2 3 4 5 6 7 8 9 0

D. At the top right of your answer sheet, for "Test Form Code", encode A.

● B C D E

E. 1) This test consists of 13 four-point and 3 multiple choice questions and two pages (both sides) of free reponse questions worth 28 points. The test is counted out of 80 points
2) The time allowed is 90 minutes.
3) You may write on the test.
4) Raise your hand if you need more scratch paper or if you have a problem with your test. DO NOT LEAVE YOUR SEAT UNLESS YOU ARE FINISHED WITH THE TEST.

F. **KEEP YOUR BUBBLE SHEET COVERED AT ALL TIMES.**

G. When you are finished:

1) Before turning in your test, check for transcribing errors. Any mistakes you leave in are there to stay.
2) Bring your test, scratch paper, bubble sheet, and any tearoff sheets to your discussion leader or proctor to turn them in. Be prepared to show your UF ID card.
3) Answers will be posted in CANVAS after the test. Grades will be posted within one week.

Multiple Questions are worth 4 points each.

1. Given the function $y = x\sqrt{25 - x^2}$, $x = 0$ is

   A. a local maximum

   B. a local minimum

   C. an inflection point

   D. absolute maximum

   E. not in the domain of the function

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2. Suppose f'' is continuous on $(-\infty, \infty)$. If $f'(7) = 0$ and $f''(7) = -2$, what can you say about f?

   A. f has a local minimum at $x = 7$

   B. f has a local maxinum at $x = 7$

   C. f has neither a maximim or a minimum at $x = 7$

   D. f has an absolute minimum at $x = 7$

   E. More information is needed to determine if f has a maximum or minimum at $x = -7$

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3. If $f(x) = 3x\ln(x)$ then the function is increasing on which of the following intervals:

   A. (e^{-1}, ∞) B. $(1, e)$ C. $(0, e)$ D. $(0, \infty)$
   E. $(0, 1)$

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4. Find the slope of the tangent to $2x^2e^y = e^{xy} + e$ at the point $(1, 1)$

A. 2 B. -3 C. $\frac{1}{2}$

D. $-\frac{1}{3}$ E. Undefined

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5. If $y = \frac{e^{3x}\sqrt{6+3x}}{(3x-1)^2}$. Find the slope of the tangent line at $x = 1$

A. $\frac{e^3}{8}$ B. $\frac{3e^3}{4}$ C. $-\frac{3e^3}{4}$ D. $\frac{5}{4}$ E. $-\frac{e^3}{24}$

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6. Find the absolute maximum and minimum values of $f(x) = \frac{\ln(x)}{x}$ on $[1, e^3]$.

A. $\frac{1}{e}$ and $\frac{3}{e^3}$ B. e and $\frac{3}{e^3}$ C. e and $\frac{1}{e}$

D. $\frac{3}{e^3}$ and 0 E. $\frac{1}{e}$ and 0

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7. Find the antiderivative of the following derivative that satisfies the given condition.
$f(x) = \frac{x^2-7}{x^2}$; $F(3) = 5$

A. $F(x) = 1 - \frac{7}{x} + C$ B. $F(x) = x + \frac{7}{x} - \frac{1}{3}$ C. $F(x) = 1 - \frac{7}{x^2} - \frac{16}{3}$

D. $F(x) = \frac{x^3-7}{x^3} + C$ E. $F(x) = x + \frac{7}{x} + 5$

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8. The position for an object is given by $s(t) = \ln(t^2 + 1)$, where $s(t)$ is its distance in feet from a starting point after t seconds. Find the acceleration of the object after 2 seconds.

A. $\frac{2}{\ln 5}$ ft/sec^2 B. $\frac{4}{5}$ ft/sec^2 C. $\frac{1}{5}$ ft/sec^2

D. $-\frac{4}{25}$ ft/sec^2 E. $-\frac{6}{25}$ ft/sec^2

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9. The total cost function for a product is $C(x) = 40 - 2x + 0.1x^2$, $0 \leq x \leq 40$, where x is measured in thousands and $C(x)$ is measured in hundreds of dollars. For what production levels x (in interval notation) is **average cost** $\bar{C}(x) = \frac{C(x)}{x}$ decreasing?

A. $(0, 25)$ B. $(10, 40)$ C. $(0, 10)$ D. $(20, 40)$ E. $(0, 20)$

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10. During **finals week**, when is the final for MAC 2233 exam scheduled?

A. Saturday at 7:30 AM

B. Saturday at 12:30PM

C. Saturday at 5:30 PM

D. Monday at 7:30 AM

E. Monday at 5:30 PM

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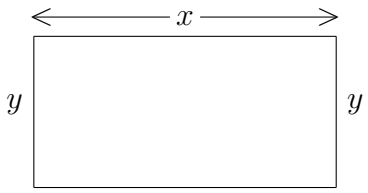
11. A homeowner wants to enclose a rectangular garden plot having an area of 2400 square feet. The fencing on the three sides of the plot are to be constructed of wood that costs \$2 per linear foot and the side facing the street is to be constructed of a decorative metal fencing that costs \$4 per linear foot. What dimensions will minimize the total cost of fencing?



Street (metal side)

A. $x = 50$ ft. and $y = 48$ ft.

B. $x = 60$ ft. and $y = 40$ ft.

C. $x = 36$ ft. and $y = 48$ ft.

D. $x = 40$ ft. and $y = 60$ ft.

E. $x = 36$ ft. and $y = 36$ ft.

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12. The relative extrema of $f(x) = \dfrac{(x+2)^2}{x}$ occur at which of the following x-values?

	relative minimum at $x =$_____	relative maximum at $x =$_____
A.	none	-2, 2
B.	-2	2
C.	-2, 2	none
D.	2	-2
E.	-2, 2	0

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13. Use differentials to approximate $\sqrt{78}$

A. $9 + 3$ B. $9 - \dfrac{1}{6}$ C. $9 + \dfrac{1}{6}$ D. $9 - \dfrac{1}{9}$ E. $9 + \dfrac{1}{9}$

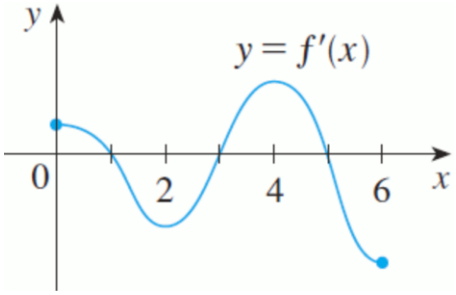
Section # _____ Name _____

UF ID # _____ Signature _____

YOU MUST SHOW ALL WORK TO RECEIVE FULL CREDIT.

1. Two people start moving from the same point. Person A travels south at 3 m/s and Person B travels west at 4 m/s. At what rate is the distance between the two people increasing two seconds later?

2. The graph of the **derivative**, $f'(x)$, of $f(x)$ is shown below. Answer the following questions.



(a) On what interval is f increasing?

(b) On what interval is f decreasing?

(c) List the critical points of f

(d) At what value(s) of x does f have a local max?

(e) At what value(s) of x does f have a local min?

(f) On what interval is f concave up?

(g) On what interval is f concave down?

(h) What value(s) of x does f have a point of inflection?

3. Consider the function $y = f(x)$ where

$$f(x) = \frac{(x-1)^3}{x^2} \qquad f'(x) = \frac{(x-1)^2(x+2)}{x^3} \qquad f''(x) = \frac{6(x-1)}{x^4}$$

(a) What is the domain of f? What are the vertical and horizontal asymptotes of f?

(b) List the critical point(s) of f. On what interval is f increasing? decreasing?

(c) List the point(s) of inflection. On what interval is f concave up? concave down?

(d) At what point(s) does f have a local maximum? local minimum?

(e) Sketch the graph of f.