Math 231: Test 2A
Spring 2016
Instructor: Linda Green

- Calculators are NOT allowed.

- Please code true/false and multiple choice answers on a scantron. These are questions 1 - 13.

- Since you have test version A, please code the "Sequence Number" on the scantron as 111111 (all 1's).

- No partial credit for multiple choice / no work needs to be shown.

- For short answer questions, you MUST SHOW WORK for full and partial credit unless otherwise specified.

- Sign the honor pledge below after completing the exam.

First and last name . . . .

PID . . . .

UNC Email . . . .

Honor Pledge: I have neither given nor received unauthorized help on this exam.

Signature: . . . .

A bug is moving left and right. Let $s(t)$ represent the position of a bug in feet to the right of the center of the room, where the center of the room is at 0 feet, 2 feet right of the center would be $s(t) = 2$, and 2 feet left of the center would be $s(t) = -2$. Let t be time in seconds.

Suppose $s'(t) < 0$ and $s''(t) > 0$ for $0 < t < 6$. True False Questions 1- 5 are related to the bug's motion while $0 < t < 6$.

1. (2 pts)True or False: The bug must be left of the center of the room.

    A. True

    B. False

2. (2 pts)True or False: The bug must be moving left.

    A. True

    B. False

3. (2 pts)True or False: The bug must be slowing down.

    A. True

    B. False

4. (2 pts)True or False: The bug's velocity must be decreasing.

    A. True

    B. False

5. (2 pts)True or False: The bug must have negative acceleration.

    A. True

    B. False

6. (2 pts) True or False: If f is a differentiable function on $(0, 10)$ and $f'(3) = 0$, then f has a local maximum or a local minimum at $x = 3$.
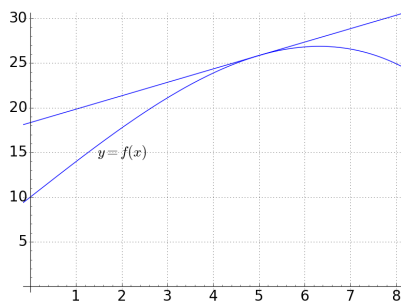
    A. True

    B. False

7. (2 pts) True or False: $\dfrac{d}{dx} log_2(5) = \dfrac{1}{ln(2) \cdot 5}$.

    A. True

    B. False

8. (2 pts) The figure below shows the graph of $y = f(x)$ and the graph of the tangent line at $x = 5$. Suppose we use the differential df to approximate the change in f as x changes from 5 to 6.

True or False: $|df| > |\Delta f|$.

    A. True

    B. False

9. (2 pts) True or False: If $f(x) = ax + b$ for some constants a and b, then the linearization of f is equal to f.

    A. True

    B. False

10. (2 pts) True or False: A strictly increasing function cannot have a local maximum.

    A. True

    B. False

11. (5 pts) $s(t) = 5t^2 - 10t$ represents the depth of a submarine in meters at time t minutes for $0 \le t \le 3$ as it moves up and down in the water (no sideways motion). What is the total distance traveled by the submarine during the first three minutes?

     A. 5 m

     B. 10 m

     C. 15 m

     D. 20 m

     E. 25 m

12. (5 pts) f and g are differentiable functions, with the following values and derivatives.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	2	3	4	-3
2	-2	2	5	2
3	3	4	1	5
4	4	3	6	5
5	9	0	1	2

Let $h(x) = f(g(2x + 1))$. Find $h'(1)$.

     A. -24

     B. -12

     C. 10

     D. 30

     E. 60

13. (10 pts) Find the absolute maximum and absolute minimum values of
    $f(x) = 2x^3 + 3x^2 - 12x$ on $[0, 2]$, and the points at which these values are achieved.

Absolute MAXimum value(s): ⬚

Absolute MAXimum point(s): ⬚

Absolute minimum value(s): ⬚

Absolute minimum point(s): ⬚

14. (10 pts) Find $\dfrac{dy}{dx}$ for $y = \sqrt{\arctan(5^x)}$. You do not need to simplify.

15. (10 pts) Find the slope of the tangent line of the curve $x^3 - 4x^2y + y^2 = 1$ at the point $(1,0)$.

16. (10 pts) Evaluate $\dfrac{dy}{dx}$ at $x = 2$ if $y = x^{g(x)}$ and $g(2) = 3$ and $g'(2) = -5$. You do not have to simplify your answer.

17. (10 pts) Find the linearization of $f(x) = \ln(2x)$ at the point $(0.5, 0)$. Use it to approximate $\ln(1.2) = \ln(2 \cdot 0.6)$

18. (10 pts) The figure shows a graph of $y = f(x)$. No work needs to be shown on this problem.
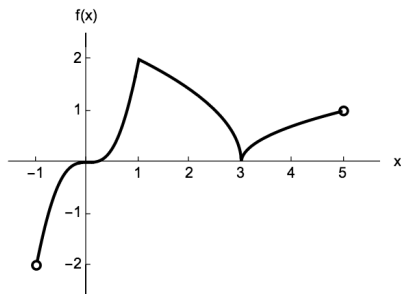
(a) Find the x-value(s) of all critical points (or write NONE).

(b) Find the x-value(s) of all local minimum points (or write NONE).

(c) Find the x-value(s) at which f attains its global minimum (or write NONE).

(d) Find the interval(s) on which f is increasing. (write your answer in interval notation or write NONE)

(e) Find the interval(s) on which the DERIVATIVE of f is increasing. (write your answer in interval notation or write NONE)

19. (10 pts) A 18-ft ladder leaning against a wall begins to slide. How fast is the angle between the ladder and the wall changing at the instant of time when the bottom of the ladder is 9 ft from the wall and sliding away from the wall at the rate of 4 ft/sec?