Math 231: Test 1A
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 Section field 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 if 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: . . . .

1. (2 pts) True or False: If f and g are continuous at $x = a$ with $g(a) \neq 0$, then $h(x) = \dfrac{f(x) + \sin(x)}{g(x)}$ is continuous at $x = a$.

   A. True

   B. False

2. (2 pts) True or False: For $f(x) = \dfrac{1}{x}$, since $f(-2) = -\dfrac{1}{2}$ and $f(2) = \dfrac{1}{2}$, there must be a number c between -2 and 2 such that $f(c) = 0$.

   A. True

   B. False

3. (2 pts) True or False: If $f(x)$ is continuous at $x = 2$ then $f(x)$ is differentiable at $x = 2$.

   A. True

   B. False

4. (2 pts) True or False: If $f(c)$ exists and f is continuous, then $\lim_{x \to c} f(x)$ exists.

   A. True

   B. False

5. (2 pts) True or False: If $\lim_{x \to c} f(x) = 0$ and $\lim_{x \to c} g(x) = 0$ then $\lim_{x \to c} \dfrac{f(x)}{g(x)}$ is either 0, ∞, $-\infty$, or DNE.

   A. True

   B. False

6. (5 pts) Find $\lim_{x \to 4} \dfrac{x + 7}{|x - 4|}$

   A. 1

   B. $\dfrac{7}{4}$

   C. $-\infty$

   D. ∞

   E. DNE

7. (5 pts) Find $\lim_{x\to 5} \frac{\sqrt{5} - \sqrt{x}}{(x-5)}$

A. 0

B. $\frac{1}{2}$

C. $-\frac{\sqrt{5}}{10}$

D. $2\sqrt{5}$

E. DNE

8. (5 pts) Find $\lim_{x\to 0} \frac{x}{\tan(5x)}$

A. 0

B. $\frac{1}{5}$

C. 1

D. 5

E. DNE

9. (5 pts) Find $\lim_{t\to\infty} \frac{5}{t^2 e^t}$

A. 0

B. 5

C. $-\infty$

D. ∞

E. DNE

10. (5 pts) Find $\lim_{x\to\infty} (\sin(x) + 5)$

A. 0

B. 5

C. 6

D. ∞

E. DNE

11. (5 pts) If $f'(-4) = 3$ and $f(-4) = 10$, find the equation of the tangent line to $y = f(x)$ at $x = -4$.
    A. $y = 3x - 4$
    B. $y = 3x + \frac{10}{3}$
    C. $y = 3x + 10$
    D. $y = 3x + 22$
    E. There is not enough information to determine the equation of the tangent line.

12. (5 pts) The function $p(t) = t^3 + 2$ represents the depth of a submarine in meters at time t minutes, as the submarine descends directly down. Find the submarine's average velocity between $t = 1$ and $t = 3$.
    A. 12 meters per minute
    B. 13 meters per minute
    C. 15 meters per minute
    D. 27 meters per minute
    E. 29 meters per minute

13. (5 pts) As in the last problem, the function $p(t) = t^3 + 2$ represents the depth of a submarine in meters at time t minutes, as the submarine descends directly down. Find the submarine's velocity at exactly $t = 3$.
    A. 12 meters per minute
    B. 13 meters per minute
    C. 15 meters per minute
    D. 27 meters per minute
    E. 29 meters per minute

14. (8 pts) Each of the following limits represents the derivative of some function $f(x)$ at some number a. State a formula for f and the value of a. You DO NOT need to find the limits or show work.

(a) $\lim_{x \to -1} \dfrac{e^x - \frac{1}{e}}{x+1}$

$f(x) =$

$a =$

(b) $\lim_{h \to 0} \dfrac{(5+h)^2 - 25}{h}$

$f(x) =$

$a =$

15. (10 pts) $y = x^3 \cos(x)$. Find $\frac{d^2y}{dx^2}$ at $x = \pi$. Show work.

16. (6 pts) Find the vertical and horizontal asymptotes (if any) of $f(x) = \dfrac{6x - 12}{x^2 - 4}$.

Horizontal Asymptote(s):

Vertical Asymptote(s):

17. (6 pts) Is if possible to find a value for c that makes the function $g(x)$ below continuous? If so, find it. If not, indicate why not. Show work to justify your answer.

$$g(x) = \begin{cases} 3, & \text{if } x \leq 1 \\ cx^2, & \text{if } 1 < x < 2 \\ 10x - 5, & \text{if } 2 \leq x \end{cases}$$

18. (10 pts) $y = \dfrac{xe^x}{3x^5 - \tan(x)}$. Find y'. Show work. DO NOT simplify.

19. (4 pts) If $\lim_{x\to 2} \dfrac{A(x+B)}{x^2 - 6x + 8} = 5$, find A and B.

$A =$	$B =$

20. (6 pts) The graph of $y = f(x)$ is drawn below. On the blank axes, sketch a graph of $y = f'(x)$.