

Name: _____
ID: _____

- 17 multiple choice questions worth 4 points each.
- 2 hand graded questions worth 16 points each.
- Exam covers sections 1.1 through 2.6.

- No graphing calculators!
Any non-graphing, non-differentiating, non-integrating scientific calculator is fine.
- For the multiple choice questions, mark your answer on the answer card.
- Show all your work for the written problems. Your ability to make your solution clear will be part of the grade.

$\sin(A \pm B) = \sin A \cos B \pm \sin B \cos A$	$\sin(2A) = 2 \sin A \cos A$
$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$	$\cos(2A) = \cos^2 A - \sin^2 A$
$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$	$\tan(2A) = \frac{2 \tan A}{1 - \tan^2 A}$
$\sin^2(A/2) = \frac{1 - \cos A}{2}$	$\cos^2(A/2) = \frac{1 + \cos A}{2}$
$\tan(A/2) = \frac{1 - \cos A}{\sin A} = \frac{\sin A}{1 + \cos A}$	
$\sin A \sin B = \frac{1}{2} [\cos(A - B) - \cos(A + B)]$	$\cos A \cos B = \frac{1}{2} [\cos(A - B) + \cos(A + B)]$
$\sin A \cos B = \frac{1}{2} [\sin(A + B) + \cos(A - B)]$	$\cos A \sin B = \frac{1}{2} [\sin(A + B) - \cos(A - B)]$
$\sin A + \sin B = 2 \sin \left(\frac{A + B}{2} \right) \cos \left(\frac{A - B}{2} \right)$	$\sin A - \sin B = 2 \cos \left(\frac{A + B}{2} \right) \sin \left(\frac{A - B}{2} \right)$
$\cos A + \cos B = 2 \cos \left(\frac{A + B}{2} \right) \cos \left(\frac{A - B}{2} \right)$	$\cos A - \cos B = -2 \sin \left(\frac{A + B}{2} \right) \sin \left(\frac{A - B}{2} \right)$
Law of Cos: $c^2 = a^2 + b^2 - 2ab \cos C$	Law of Sin: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

1. Find the limit

$$\lim_{x \rightarrow 0} \frac{\cos x}{x - 2}$$

- A. 1
- B. 0
- C. $\frac{1}{2}$
- D. 2
- E. -1
- F. $-\frac{1}{2}$
- G. -2
- H. Does not exist

2. Find the domain of the function

$$f(x) = \frac{\sqrt{x}}{1 - \frac{1}{1+x}}$$

- A. $(-\infty, \infty)$
- B. $(-\infty, 0)$
- C. $(-\infty, 0]$
- D. $[0, \infty)$
- E. $(0, \infty)$
- F. $(-\infty, -1) \cup (-1, \infty)$
- G. $(-\infty, 1) \cup (1, \infty)$
- H. $(-\infty, -1) \cup (1, \infty)$

3. Let $f(x) = 2 \cdot 5^{4x}$. Write it in the form $y = Ae^{kx}$.

- A. $y = 2 \cdot 5^{4x}$
- B. $y = 2 \cdot 4^x$
- C. $y = 2 \cdot e^{4x}$
- D. $y = 2 \cdot e^{5x}$
- E. $y = 2 \cdot e^{(5 \ln 4)x}$
- F. $y = 2 \cdot e^{(4 \ln 5)x}$
- G. $y = e^{20x}$
- H. $y = e^{40x}$

4. Let $f(x) = x^2$ and $g(x) = \frac{4}{5+x}$. Find $(fg - f \circ g)(-3)$

- A. -3
- B. 0
- C. 3
- D. 10
- E. 14
- F. 20
- G. 100
- H. Does not exist

5. Find the inverse of the function $f(x) = \frac{1}{3}\sqrt{x-5} + 2$

- A. $f^{-1}(x) = \frac{1}{3}\sqrt{x-5} + 2$
- B. $f^{-1}(x) = \frac{3}{\sqrt{x-5}} + \frac{1}{2}$
- C. $f^{-1}(x) = \frac{1}{\frac{1}{3}\sqrt{x-5}+2}$
- D. $f^{-1}(x) = x^2 - 4x + 4$
- E. $f^{-1}(x) = x^2 - 4x + 9$
- F. $f^{-1}(x) = 9x^2 - 36x + 36$
- G. $f^{-1}(x) = 9x^2 - 36x + 41$
- H. The function $f(x)$ does not have an inverse.

6. Solve for x :

$$\ln(\ln x) = 1$$

A. $x = 0$

B. $x = 1$

C. $x = e$

D. $x = e^2$

E. $x = e^e$

F. $x = \ln 2$

G. $x = \ln 4$

7. If $f(x) = \frac{1}{2} + \frac{e^{(x-4)}}{2}$. What is $f^{-1}(1)$?

A. $x = -1$

B. $x = 0$

C. $x = 1$

D. $x = 2$

E. $x = 3$

F. $x = 4$

G. $x = 5$

H. $x = \pi$

8. Find the limit

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 - x - 2}$$

- A. 0
- B. $\frac{1}{2}$
- C. $\frac{3}{4}$
- D. 1
- E. $\frac{5}{4}$
- F. $\frac{4}{3}$
- G. 2
- H. $-\infty$
- I. ∞
- J. Does not exist

9. Find the limit

$$\lim_{x \rightarrow 0} \frac{x}{\sqrt{7} - \sqrt{7+x}}$$

- A. $-2\sqrt{7}$
- B. $-\sqrt{7}$
- C. 0
- D. $\sqrt{7}$
- E. $2\sqrt{7}$
- F. Does not exist

10. Find the domain of $f(x) = (\sqrt{2-x})(\ln x)$

- A. $(-\infty, \infty)$
- B. $(0, \infty)$
- C. $(-\infty, 2)$
- D. $(0, 2)$
- E. $(0, 2]$
- F. $(2, \infty)$
- G. $[2, 4]$

11. Find the limit

$$\lim_{h \rightarrow 1^-} \frac{|h-1|}{h-1}$$

- A. -1
- B. $-\frac{1}{2}$
- C. 0
- D. $\frac{1}{2}$
- E. 1
- F. Does not exist

12. Suppose you know the following about the functions $f(x)$ and $g(x)$.

$$\begin{array}{ll} \lim_{x \rightarrow 3} f(x) = 4 & \lim_{x \rightarrow 3} g(x) = 5 \\ f(3) = 9 & g(3) = 3 \end{array}$$

Find

$$\lim_{x \rightarrow 3} \frac{\sqrt{f(x)} + g(x)}{1 - (g(x))^2}$$

- A. -1
- B. $-\frac{7}{8}$
- C. $-\frac{6}{8}$
- D. $-\frac{5}{8}$
- E. $-\frac{1}{3}$
- F. $-\frac{7}{24}$
- G. $-\frac{1}{4}$
- H. $-\frac{5}{24}$
- I. 0
- J. 1
- K. Does not exist

13. Let

$$f(x) = \begin{cases} x^2 + 2 & \text{if } x < -1 \\ 1 & \text{if } x = -1 \\ (x + 3)^3 - 5 & \text{if } x > -1 \end{cases}$$

Find $\lim_{x \rightarrow -1} f(x)$

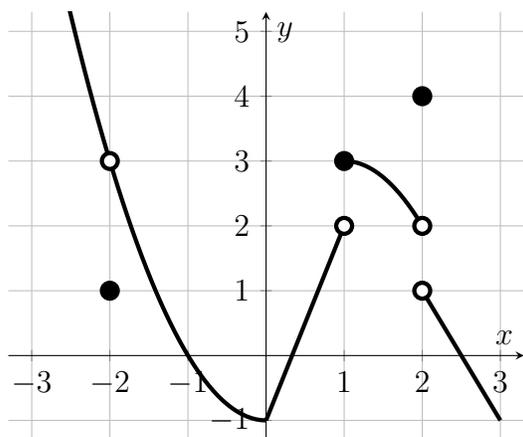
- A. -5
- B. -3
- C. -2
- D. -1
- E. 0
- F. 1
- G. 2
- H. 3
- I. 4
- J. 5
- K. Does not exist

14. Find the constant c that makes the function g continuous on $(-\infty, +\infty)$.

$$g(x) = \begin{cases} x^2 & \text{if } x < 2 \\ cx + 10 & \text{if } x \geq 2 \end{cases}$$

- A. $c = -3$
- B. $c = -2$
- C. $c = -1$
- D. $c = 0$
- E. $c = 1$
- F. $c = 2$
- G. $c = 3$
- H. $c = 4$
- I. $c = 10$
- J. It is not possible to find such a c .

15. Consider the graph of the function $F(x)$ below.



Find

$$\left(\lim_{x \rightarrow -2} F(x) \right) + F(-2) + \left(\lim_{x \rightarrow 1^-} F(x) \right) + \left(\lim_{x \rightarrow 1^+} F(x) \right) + \left(\lim_{x \rightarrow 2^-} F(x) \right) + \left(\lim_{x \rightarrow 2^+} F(x) \right) + F(2)$$

- A. $-\pi$
- B. 0
- C. 12
- D. 13
- E. 14
- F. 15
- G. 16
- H. 17
- I. 18
- J. ∞
- K. At least one of these does not exist so we can't find a sum

16. Which of the following functions below, all defined on the real line, have an inverse function?

I. $h(x) = -5(x + 5)^2 + 45$

II. $g(x) = 1 + e^{4x}$

III. $f(x) = \sin x$

A. None of these

B. I only

C. II only

D. III only

E. I and II only

F. I and III only

G. II and III only

H. I, II and III

17. Compute

$$\lim_{x \rightarrow \infty} \frac{8x^4 - 12x + 1023}{4x^4 - 1228x^2 + 654x + 15}$$

A. $-\infty$

B. 0

C. 2

D. 4

E. 8

F. ∞

G. Does not exist

Name: _____

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Written Problem. You will be graded on the readability of your work.
Use the back of this sheet, if necessary.

18.

$$f(x) = \begin{cases} 3 & \text{if } x < -1 \\ 2x & \text{if } -1 \leq x \leq 1 \\ \frac{6x+2}{x+3} & \text{if } x > 1 \end{cases}$$

Find the following:

(a) $\lim_{x \rightarrow -1^-} f(x)$

(b) $\lim_{x \rightarrow -1^+} f(x)$

(c) $f(-1)$

(d) $\lim_{x \rightarrow 1^-} f(x)$

(e) $\lim_{x \rightarrow 1^+} f(x)$

(f) $f(1)$

(g) $\lim_{x \rightarrow -\infty} f(x)$

(h) $\lim_{x \rightarrow \infty} f(x)$

(i) Describe all points where $f(x)$ is continuous and all points where $f(x)$ is not continuous. Explain.

Name: _____

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Written Problem. You will be graded on the readability of your work.
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19. Suppose the function $f(x)$ satisfies the following:

$$\lim_{x \rightarrow -2^-} f(x) = 3$$

$$\lim_{x \rightarrow -2^+} f(x) = 4$$

$$\lim_{x \rightarrow 1^-} f(x) = 1$$

$$\lim_{x \rightarrow 1^+} f(x) = -1$$

$$\lim_{x \rightarrow 2} f(x) = 2$$

$$f(2) = 3$$

(a) Draw a possible graph of a function $f(x)$ satisfying these properties.

(b) Describe all points where function $f(x)$ is continuous and where $f(x)$ is not continuous? Explain.