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001

Math 112 Exam 1

February 8-10, 2016
(Late Day: February 11, 2016)

Name: _____

Section: _____

Instructor: _____

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Instructions

- I) Do not write on the barcode area at the top of each page, or near the four circles on each page.
- II) Fill in the correct boxes for your BYU ID and for the correct answer on the multiple choice completely. Multiple choice questions are 5 points each.
- III) For questions which require a written answer, show all your work in the space provided and justify your answer.
- IV) Simplify your answers.
- V) No books, notes, or calculators of any type are allowed.
- VI) There is no time limit on this exam.

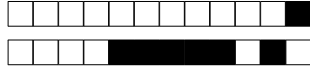
**Part I: Multiple Choice Questions:** *Mark the correct answer. (3 points each)*

1 Suppose the movement of an object is described by the equation $y = 2t - 4t^2$ where y indicates its distance from a starting point, in feet, after time, t , in seconds. Find the average velocity of the object over the interval from 2 to 5 seconds.

- 25 ft/sec
- 16 ft/sec
- 24 ft/sec
- 26 ft/sec
- 34 ft/sec

2 Consider the functions, $f(x) = \frac{x}{x+1}$ and $g(x) = x|x|$. Select the correct statement from the answer options below:

- Both functions are neither even nor odd
- $f(x)$ is even and $g(x)$ is odd
- $f(x)$ is neither even nor odd and $g(x)$ is even
- $f(x)$ is odd and $g(x)$ is even
- $f(x)$ is neither even nor odd and $g(x)$ is odd



3 The value of the constant k that makes $f(x) = \begin{cases} (x-2)^2, & \text{if } x \geq 0 \\ -3x+k, & \text{if } x < 0 \end{cases}$ continuous everywhere is:

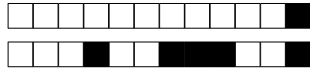
- $\frac{2}{3}$
- 0
- $\frac{3}{2}$
- 4
- 2
- 2

4 Given $f(x) = 2x - 1$, $g(x) = x^2$, and $h(x) = 1 - x$, find and simplify $f \circ g \circ h$.

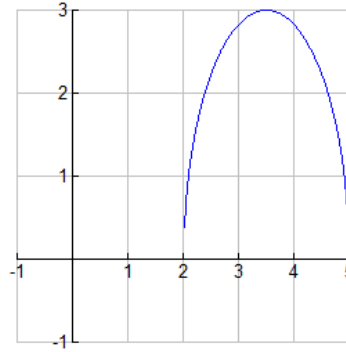
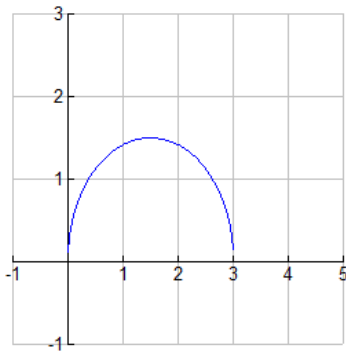
- $-4x^2 + 4x$
- $2x^2 - 4x + 1$
- $x^2 - 7x + 2$
- $x^2 + 6x + 1$
- $2x^2 + 12x + 2$

5 Find all values of x for which the function is discontinuous: $f(x) = \frac{-5+x}{9x^2+3x}$.

- $x = 0$ and $x = -\frac{1}{3}$
- $x = 0$
- $x = 0$ and $x = \frac{1}{3}$
- $x = 5$
- $x = 3$ and $x = -3$



6 The graph of $f(x)$ is shown below left. Find an expression for the graph shown below right.



- $2f(x + 2)$
- $f(x + 2) - 2$
- $2f(x)$
- $f(x - 2) + 2$
- $2f(x - 2)$

7 Calculate this limit: $\lim_{x \rightarrow 4} \frac{x^2 - 16}{x - 4}$.

- 8
- ∞
- $-\infty$
- 4
- 4
- the limit doesn't exist



8 Find the limit: $\lim_{x \rightarrow 1} e^{x^3 - x}$.

- 0
 1
 e
 the limit doesn't exist
 -1

9 Find all horizontal and vertical asymptotes of the function $y = \frac{5 + 4x}{x + 3}$.

- horizontal at $y = \frac{5}{3}$, vertical at $x = 4$
 horizontal at $y = 4$, vertical at $x = -3$
 horizontal at $y = 3$, vertical at $x = 4$
 horizontal at $x = -3$, no vertical
 no horizontal or vertical asymptotes

10 $\tan(\sin^{-1} x)$ can be simplified to which of the following:

- $\frac{x}{\sqrt{1 + x^2}}$
 $\frac{x}{\sqrt{1 - x^2}}$
 $\frac{\sqrt{1 - x^2}}{x}$
 $\frac{x}{\sqrt{x^2 - 1}}$
 x



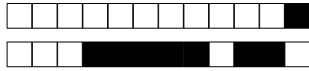
11 Let $f(x) = \begin{cases} x^2 + 1 & \text{if } x < 1 \\ (x - 2)^2 & \text{if } x \geq 1 \end{cases}$. Find the $\lim_{x \rightarrow 1} f(x)$ if it exists.

- 2
 2
 0
 the limit does not exist
 1

12 Which of the following statements is false?

- i. Polynomial functions are continuous for all real numbers.
- ii. Rational functions are continuous for all real numbers.
- iii. The $\sin(x)$ and $\cos(x)$ functions are continuous for all real numbers.
- iv. The tangent function is continuous for all values in its domain.
- v. If $f(x)$ and $g(x)$ are both continuous at a point, c , then $f(x) + g(x)$ will be continuous as point c .

- statement ii is false
 statement i is false
 none of the statements is false
 statement v is false
 statement iii is false
 statement iv is false



Part II: *Free response: Write your answer in the space provided. Answers not placed in this space will be ignored.*

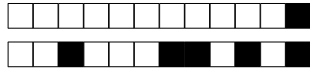
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(a) Find the domain of: $y = \sqrt{e^{2x} - 3}$.

(b) Find an equation for the inverse of this function: $y = \frac{x + 1}{2x + 1}$.

(c) Find the limit: $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1}$



14

0 1 2 3 4 5 6 7 8 DON'T MARK

On parts a–g, find the exact value of each expression. On part h, solve for x .

(a) $\tan\left(\frac{5\pi}{6}\right)$

(b) $\sin\left(\frac{-\pi}{3}\right)$

(c) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

(d) $\sec\left(\frac{\pi}{3}\right)$

(e) $\log_{16} 60 - \log_{16} 3 - \log_{16} 5$

(f) $\ln\left(\frac{1}{e^2}\right)$

(g) $\log_{10}(1000)$

(h) Solve for x : $\log_{10}(3x + 10) = 2$



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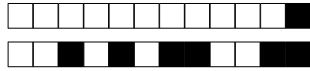
Evaluate each of the following limits or indicate that the limit does not exist.

(a) $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{x^2 + x} \right)$

(b) $\lim_{x \rightarrow 1} \left(\frac{x^3 - 1}{x^2 - 1} \right)$

(c) $\lim_{x \rightarrow -3} \frac{2x + 6}{|x + 3|}$

(d) $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 4} - 3x}{x}$

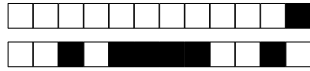


+1/10/51+

16

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Given: $\lim_{x \rightarrow 1} \frac{2+4x}{3} = 2$. Find the largest possible number δ so that when $|x - 1| < \delta$,
then $\left| \frac{2+4x}{3} - 2 \right| < 1$.



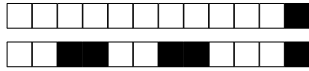
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Given the following piecewise function: $f(x) = \begin{cases} x - 1 & \text{if } x < 1 \\ 0 & \text{if } 1 \leq x \leq 4 \\ x - 2 & \text{if } x > 4 \end{cases}$

(a) Identify any values of x for which the function is discontinuous.

(b) For any x values identified in part a, give a justification for why the function is discontinuous at that value of x .

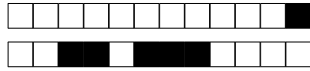


+1/12/49+

18

0 1 2 3 4 5 6 7 8 9 **DON'T MARK**

Show without graphing that the function $f(x) = x^3 + 2x - 4$ has a zero. Justify your answer.



+1/13/48+

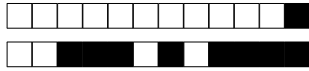
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0 1 2 3 4 5 6 7 8 9 10 DON'T MARK

Consider the function: $f(x) = 3x^2 - 4x + 1$.

- (a) Find $f'(2)$ using the limit definition of the derivative. Full credit will not be given if the limit definition is not used.

- (b) Find the equation of the tangent line to the curve at the point where $x = 2$.



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