Math 3A HW #4

Answers must be submitted via Moodle before 10AM on Wednesday, March 8th, 2017.

Good luck!

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find all points where the function is discontinuous.

1) \[ f(x) = \begin{cases} -x^2 + 1, & -1 \leq x < 0 \\ 4x, & 0 < x < 1 \\ -5, & x = 1 \\ -4x + 8, & 1 < x < 3 \\ 1, & 3 < x \leq 5 \end{cases} \]

A) x = 0 
B) x = 0, x = 1 
C) None 
D) x = 1

Provide an appropriate response.

2) Is \( f \) continuous at \( f(1) \)?

A) No 
B) Yes

Find the intervals on which the function is continuous.

3) \[ y = \frac{x + 3}{x^2 - 5x + 4} \]

A) discontinuous only when \( x = -4 \) or \( x = 1 \)
B) discontinuous only when \( x = 1 \)
C) discontinuous only when \( x = -1 \) or \( x = 4 \)
D) discontinuous only when \( x = 1 \) or \( x = 4 \)

4) \[ y = \frac{2}{x + 7} - 2x \]

A) discontinuous only when \( x = 7 \) 
B) continuous everywhere 
C) discontinuous only when \( x = -7 \) 
D) discontinuous only when \( x = -9 \)
Find numbers a and b, or k, so that f is continuous at every point.

5) \( f(x) = \begin{cases} x^2, & \text{if } x \leq 4 \\ x + k, & \text{if } x > 4 \end{cases} \)

A) \( k = 12 \)  B) \( k = 20 \)  C) \( k = -4 \)  D) Impossible

6) \( f(x) = \begin{cases} x^2, & x < -4 \\ ax + b, & -4 \leq x \leq 5 \\ x + 20, & x > 5 \end{cases} \)

A) \( a = 1, b = -20 \)  B) \( a = 1, b = 20 \)  C) \( a = -1, b = 20 \)  D) Impossible

Find the root of the given function using a sufficient number of iterations of the intermediate value theorem. Select the answer that closest represents your result. (Basically, use the IVT method outlined in class to get a number close to one of the four choices below.)

7) \( f(x) = x^5 - \frac{x^3}{5} + 2 \)

A) \( x \approx -1.184574 \)  B) \( x \approx -0.854574 \)  C) \( x \approx -1.074574 \)  D) \( x \approx -0.964574 \)

Use the graph to find a \( \delta > 0 \) such that for all \( x, 0 < |x - x_0| < \delta \Rightarrow |f(x) - L| < \varepsilon \).

8) \[ y = \sqrt{x} \\
\begin{array}{c}
0.166 \\
0.141 \\
0.116 \\
\hline
1.3575 \\
2 \\
2.7675
\end{array} \]

A) 1.41  B) -0.59  C) 0.6425  D) 0.7675

A function \( f(x) \), a point \( x_0 \), the limit of \( f(x) \) as \( x \) approaches \( x_0 \), and a positive number \( \varepsilon \) is given. Find a number \( \delta > 0 \) such that for all \( x, 0 < |x - x_0| < \delta \Rightarrow |f(x) - L| < \varepsilon \).

9) \( f(x) = 6x + 5, L = 17, x_0 = 2, \) and \( \varepsilon = 0.01 \)

A) 0.003333  B) 0.008333  C) 0.005  D) 0.001667

10) \( f(x) = 6x^2, L = 150, x_0 = 5, \) and \( \varepsilon = 0.4 \)

A) 5.00666  B) 4.99333  C) 0.00667  D) 0.00666
Find the derivative.

11) \( y = 14 - 12x^2 \)
   A) 14 - 12x  
   B) -24x  
   C) 14 - 24x  
   D) -24  

12) \( y = 7 - 4x^3 \)
   A) -12x^2  
   B) -12x  
   C) 7 - 12x^2  
   D) -8x^2  

13) \( y = 2x^4 + 6x^3 + 2 \)
   A) 8x^3 + 18x^2  
   B) 4x^3 + 3x^2  
   C) 8x^3 + 18x^2 - 7  
   D) 4x^3 + 3x^2 - 7  

Find the derivative of the function by first expanding or simplifying the expression.

14) \( f(x) = (4x - 2)(6x + 1) \)
   A) \( f'(x) = 48x - 4 \)  
   B) \( f'(x) = 48x - 8 \)  
   C) \( f'(x) = 48x - 16 \)  
   D) \( f'(x) = 24x - 8 \)  

15) \( f(x) = \frac{5x^2 + 30x}{5x} \)
   A) \( f'(x) = x + 6 \)  
   B) \( f'(x) = 10x \)  
   C) \( f'(x) = 5 \)  
   D) \( f'(x) = 1 \)  

Find the second derivative.

16) \( y = 3x^4 - 8x^2 + 7 \)
   A) 36x^2 - 16x  
   B) 36x^2 - 16  
   C) 12x^2 - 16x  
   D) 12x^2 - 16  

17) \( y = 3x^3 - 8x^2 + 2e^x \)
   A) 16x - 12 + 2e^x  
   B) 12x - 16 + 2e^x  
   C) 16x - 18 + 2e^x  
   D) 18x - 16 + 2e^x  

Solve the problem.

18) Assume that a watermelon dropped from a tall building falls \( y = 16t^2 \) ft in \( t \) sec. Find the watermelon’s average speed during the first 4 sec of fall and the speed at the instant \( t = 4 \) sec.
   A) 64 ft/sec; 128 ft/sec  
   B) 65 ft/sec; 130 ft/sec  
   C) 128 ft/sec; 65 ft/sec  
   D) 32 ft/sec; 64 ft/sec  

19) For a motorcycle traveling at speed \( v \) (in mph) when the brakes are applied, the distance \( D \) (in feet) required to stop the motorcycle may be approximated by the formula \( D = 0.05v^2 + v \). Find the instantaneous rate of change of distance with respect to velocity when the speed is 45 mph.
   A) 11 mph  
   B) 46 mph  
   C) 5.5 mph  
   D) 4.5 mph