Name: ___________________________

Begin by enrolling in the BC Calculus Course for the 2017-18 school year in Google classroom. The class code is ***<u>rb55ut5</u>***

Dear Future BC Calculus Student,

If you are receiving this assignment, then you have signed up for BC Calculus. We have lots of material to cover next year to get you ready for the AP Calculus test next May. This assignment includes material that is important for the success of every calculus student and we want you to be well prepared.

<u>The assignment is due the first day of class! --- for a grade!</u>

I hope you have a great summer and I look forward to working with everyone when we return in August.

Sincerely,

Mark Landry

BC Calculus **Name: ______________________**
Summer Homework Assignment **Due on the First Day of Class 2017-18**

Find each limit if it exists. If the limit does not exist, write DNE and then state the reason.

1. ___________ $\lim_{h \to 0} \frac{(h-5)^2 - 25}{h}$

2. ___________ $\lim_{x \to -\infty} \frac{20x^3 - 2}{5x^3 + 4}$

3. ___________ $\lim_{x \to 6} \frac{|x-6|}{x-6}$

4. ___________ $\lim_{x \to \infty} \frac{10x}{2-5x}$

5. ___________ $\lim_{x \to 2} \sqrt{4 - x^2}$

6. ___________ $\lim_{x \to -\infty} \frac{\sqrt{16x^2 - 4}}{8x + 20}$

7. ___________ $\lim_{x \to \infty} \ln(1 + e^{-x})$

8. ___________ $\lim_{x \to 0} \frac{10x}{\sqrt{x+2}-\sqrt{2}}$

9. ___________ $\lim_{x \to -3} \frac{x^3+x^2+x+21}{x+3}$

10. ___________ $\lim_{x \to 0} \frac{\sin x}{x}$

Find each derivative. Do NOT simplify.

11. $y = 6x^{4/3} - 12x^{1/2} - 4x^{-1/2}$

12. $y = \frac{\tan x}{e^{2x}}$

13. $y = \cos^{-1}(5x)$

14. $y = [\cot(\sin 5x)]^4$

15. $y = \sqrt{9x^2 - 10x + 1}$

16. $y = e^{5x^2} \cdot \ln x^2$

17. $y = 3^{4x}$

18. $y = \int_3^{2x^3} \csc^{-1}(x) \cdot dx$

19. $y = \log_3 \left(6x^2\right)$

20. $\frac{d}{dx}\left(4x^2y - 3xy + 5y = 92\right)$ Do NOT solve for dy/dx.

Find each indefinite integral. Do NOT simplify.

21. $\int x\sqrt{5x^2-2}\cdot dx$

22. $\int \left(5x^2-1\right)^2 \cdot dx$

23. $\int \left(6x^2-1\right)^{49} x \cdot dx$

24. $\int \sin^4(2x)\cos 2x \cdot dx$

25. $\int \frac{x^2}{\sqrt{x^3+5}}dx$

26. $\int \left(e^x+e^{-x}\right)^2 dx$

27. $\int 10^{2x} dx$

28. $\int \frac{(\ln 3x)^4}{x}dx$

Find each definite integral. Show work and use correct notation. Simplify answers and leave in exact form.

29. $\int_0^{15} \frac{1}{\sqrt{x+1}} \cdot dx$

30. $\int_0^{\pi} 12\sin(3x) \cdot dx$

31. Write the definition for the derivative of f(x) at x = c.

32. Using the definition above, find the derivative of $f(x) = 4x^2 + 10x$ at $x = -3$.

33. Complete the definition of continuity:

A function is continuous at a point x = c if and only if:

i. ____________________

ii. ____________________

iii. ____________________

34. Assume that $h(x) = f(g(x))$, where both f and g are differentiable functions.
If g(3) =10, g'(3) = 2, and f'(10) = 5, what is the value of h'(3)? To answer this question, apply the definition of the chain rule directly.

35. Function h is differentiable and strictly increasing for all real numbers. The following table gives values for the function and its derivative at selected values of x. If $h^{-1}(x)$ is the inverse of h(x), write an equation for the line tangent to the graph of $y = h^{-1}(x)$ at x = 3.

x	h(x)	h'(x)
2	3	6
3	12	12
4	27	18

36. Differentiability and continuity. Fill in the blank with "continuous" or "differentiable".

If a function is _________________________, then it is _____________________________.

If a function is NOT __________________________, then it is NOT ______________________________.

37. If $f(x) = x^{3/2}$ find a value c in the interval from x = 1 to x = 4 where the conclusion of the MVT is true.

Calculators allowed for part of the assignment. **Name: ______________________**

38. Find f'(x) and then solve for the values of a and b that make the function continuous and differentiable for all real numbers.

$$f(x)=\begin{cases} ax^2-2ax+4 & \text{if } x\le 1 \\ bx^2-4x & \text{if } x>1 \end{cases} \qquad f'(x)=\begin{cases} & \\ & \end{cases}$$

39. Consider the equation $2xy+y^2=16$.

a. Confirm that $\frac{dy}{dx}=\frac{-y}{x+y}$. Show your work for credit.

b. Find the equation of the line tangent to the graph at the point on the graph that has a y-coordinate of 2.

40. For the function $f(x) = x^{4/3}$

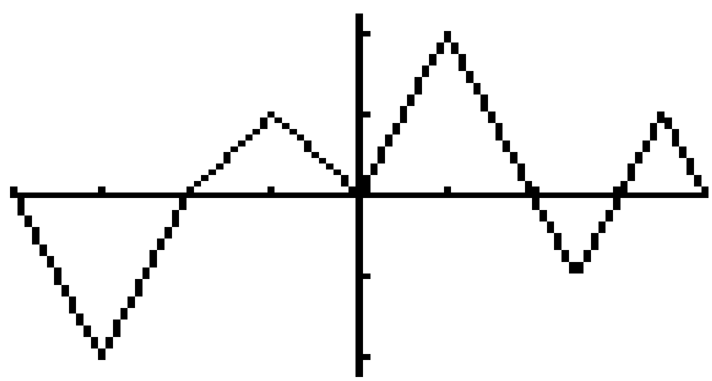
a. Find an equation for the linear approximation of f(x) at x = 8.

b. Use the linear approximation to estimate f(8.2) to the nearest thousandth.

c. Use the information above to find the values of the following to the nearest thousandth.

$\Delta x =$ ______ $\Delta y =$ ______ $dx =$ ______ $dy =$ ______ $error =$ ______

41. To the right is the graph of the function ***f*** consisting of 8 straight line segments. Scale markings on the x-axis are 4. Scale markings on the y-axis are 1.



Evaluate the expressions below given functions g and h below.

$$g(x) = \int_0^x f(t) \cdot dt$$

$$h(x) = \int_0^x |f(t)| \cdot dt$$

$g(8) =$	________	$g'(8) =$	________
$g''(8) =$	________	$g(12) =$	________
$g(-8) =$	________	$g(-16) =$	________
$h(8) =$	________	$h(12) =$	________
$h(-16) =$	________	$h(16) =$	________

42. The velocity of a beetle as it crawls up and down the length of a tree (both above and below ground) is given by the function v(t), where v is in cm/minute, t is in minutes. At time t = 0, the beetle is 10 cm above the ground.

$$v(t) = 3t^2 - 8t + 2 \quad where \quad 0 \leq t \leq 4$$

a. Find the velocity of the beetle at t = 2 minutes. Include a unit of measure.

b. What is the speed and direction of the beetle at t = 2 minutes?

c. Is the beetle speeding up or slowing down at t = 2 minutes? At what rate?

d. What is the displacement of the beetle from t = 0 to t = 4 minutes?

e. What is the height of the beetle at t = 4 minutes?

43. When you pull a box across a floor, you must exert a certain force. The amount of force needed may increase with distance if the bottom of the box becomes damaged as it moves. Assume that the force needed to move a particular box is given by $F(x) = 80e^{0.2x}$ where ***F(x)*** is the number of pounds that must be exerted when the box has moved x feet across the floor.

  a. Find a function for the rate of change of the force needed to move the box with respect to the distance the box has moved. Simplify the function.

  b. At what rate is force changing when it has moved 6 feet? Include a unit of measure.

  c. At what distance will the amount of force needed to move the box reach 100 pounds? Include units of measure.

  d. At what distance will the rate of change of force reach 50 pounds per foot. Include units of measure.

  e. Recall that work, ***W*** in foot-pounds, equals total force exerted times distance moved. Find a function for ***W(d)***, the total work done if the box is moved from its starting position, x = 0, to a point ***d*** feet away.

  f. How much work must be done to move a box from its starting position to a point 6 feet away? Include units of measure.