Math 151

Show Your Work! Oct. 30, 2018 Name ____________________________

Good Luck! Test #2 A (please print)

1. Calculate these 5 derivatives (Do **not** simplify once all derivatives are calculated.)

   Show work & circle your final answers.

   (a) $D(\ x^3 \cdot \tan(\ e^x\ )\ ) =$

(5 each)

   (b) $D(\ \cos^4(3x+2)) =$

   (c) $\dfrac{d}{dt}\left(\ \ln\left(e^t + \sin(3t)\right)\ \right) =$

   (d) $\dfrac{d}{dt}\left(\dfrac{3+\cos(t)}{1+\sin(t)}\right) =$

   (e) $f(x) = \sqrt{\pi^3 + \sec(3x)}$. f '(x) =

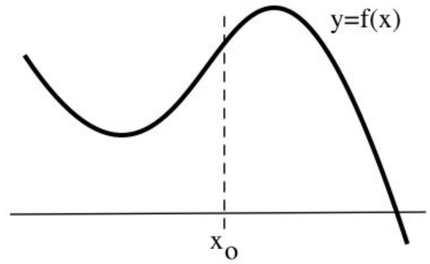
2. $4x + 9y + x^2y^3 = 9x + 3y^2$, Calculate $\dfrac{dy}{dx}$ at the point (2, 1) on the graph. $\dfrac{dy}{dx} =$ __________ (exact fraction)

(6)

3. The figure shows the graph of f(x) and the location of x_0.

Find and LABEL the locations of x_1 and x_2 obtained by using Newton's Method..

(4)



4. $f(x) = x^3 - x + 1$. If we start with $x_0 = 1$,

then using Newton's Method x_1 =____________ , x_2 = ____________ (2 decimal places)

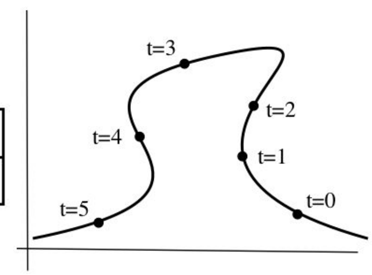
(4)

5. (a) See the figure at the right, and use that information to fill in the blanks in the table with

POS, NEG, ZERO or UND when **t=2**.

(4)

dx/dt	dy/dt	dy/dx



(b) When **t=3**, $\frac{dy}{dt}$ is POS, NEG, ZERO or UND

6. The location of an robot at time t minutes is x(t) = 2t + 3sin(t) , $y(t) = t^2 - \cos(t)$ meters. (RADIAN mode!)

(Round answers to TWO decimal places. UNITS!)

(2) (a) When t = 2 minutes, the location of the robot is. (,)

(9) (b) When t = 2 minutes, $\frac{dx}{dt}$ = ___________ $\frac{dy}{dt}$ = ___________ $\frac{dy}{dx}$ = ____________

(3) (c) When t = 2 minutes, the SPEED of the robot is ____________________

7. Each answer should be a number. Use the table for the g and g ' values.

(a) at x=1 $D(\, g(3x)\,) =$ _____ (b) at x=1 $D(\, g^3(x)\,) =$ ______

(c) at x=1 $D(\, g(x^2+1)\,) =$ ______ (d) at x=1 $D(\, x \cdot g(x)\,) =$ ______

(2 each)

x	g(x)	g '(x)
0	2	–3
1	1	4
2	3	2
3	2	–1
4	1	0

8. A bug is crawling back and forth along the x-axis (marked in cm) , and the bug's location at time t minutes is

$h(t) = t^3 - 3t^2 + 50$ cm . **(Be sure to include units with your answers.)**

(3) (a) What is the bug's velocity after 3 minutes? _______________

(3) (b) When will the bug change directions? ___________________

(3) (c) How far will the bug crawl during the first 6 minutes? ______________

(3) (d) What is the bug's acceleration when t=2 minutes? ______________

9. The number of bacteria at time t hours is $B(t) = 180 + 50\sin(t) + 60 \cdot e^{-0.4t}$.

(4) How fast is the bacteria population changing when $t = 3$? _____________________

10. (a) $f(x) = \sqrt{x}$. Find the linear approximation L(x) of f(x) when x = 49. L(x) = ___________________

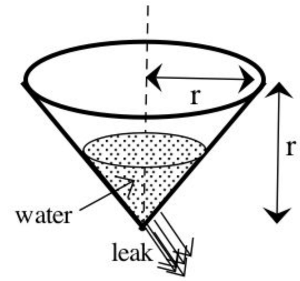
(b) Use your result in part (a) to approximate the value of $\sqrt{52} \approx$ ______________ (3 decimal places)

(c) For this f(x) and at x=49, df = ___________________

(3) (3) (2)

11. Do **2** of these problems. (If you do all three, I will only grade A and B.) UNITS !!

A. A bug is walking along the x-axis and the bug's location at time t minutes is 3t+1 cm. The bug's temperature T (in ^oF) at location x cm on the x-axis is x^2. How fast is the bug's temperature changing when t = 3 minutes. $\frac{dT}{dt}=$ ______________



B. A cone with radius equal to its height contains water. The water is leaking out of the bottom at a rate of 3 cm^3/second. How fast is the height of the water changing when the height is 7 cm. ____________________ ($V=\frac{1}{3}\pi r^2 h$)

C. A red car is 30 miles north of Bellevue and driving north at 40 miles per hour. A blue car is 50 miles east of Bellevue and driving west at 10 miles per hour. How fast is the distance between the cars changing? ______________________

Problem A B C (circle one)

(6 each)

Problem A B C (circle one)

BONUS: (+2 if correct) Find a function g(x) so $D(\ g(x)\ )=\frac{2x}{5+x^2}+6\cdot\sec^2(x)$.

g(x) = ____________________________________

the end! (points = 101 + 2 bonus. Tests back tomorrow.)