Name:

Math 108
Fall 2018
Dr. Lily Yen

Test 3
Show all your work

Number:
Signature:
Score: ___/40

## No Calculator allowed in this part.

Problem 1: Find $d y / d x$ for $x+\sqrt{x} \sqrt{y}=y^{2}$.

At the point $(2,2)$, find the equation of the tangent line to the given curve defined implicitly in this problem.

Score: $\quad / 5$
Problem 2: Match each graph of $y=f^{\prime}(x)$ (A-D) with the graph of a possible $y=f(x)$ (1-15).


Answer:


Answer:


Answer:


Answer:

Possible graphs, $y=f(x)$ below whose derivative graphs are $\mathrm{A}, \mathrm{B}, \mathrm{C}, \mathrm{D}$ above:


## Calculators allowed for this part.

Problem 3: The number of bank burglaries (entry into or theft from a bank during nonbusiness hours) in the US for the years 2000 to 2009 is given in the graph below where the dots represent actual data.

a. How many bank burglaries are predicted by the model in 2010?
b. Find the average number of bank burglaries per year from 2000 to and including 2005 .
c. According to the model, when does the instantaneous rate of change of bank burglaries equal to the average rate of change between 2000 and 2005? Show your work on the graph.

Score: /5
Problem 4: Use linear approximation to estimate $\sqrt[3]{7.9}$ to 4 decimal places. Clearly state your function, then show the formula of linear approximation and identify all parts defined in your formula.

Problem 5: Epidemiologists have found this year's flu rampant in Capilano University. They estimate that $t$ days after the flu virus is first observed on campus, the percent of the population infected by the disease is approximated by

$$
p(t)=\frac{18.75 t^{3}-0.984 t^{4}}{1023}, \quad 0 \leq t \leq 20
$$

a. Graph the function in the given domain.
b. After how many days is the percent of the population infected a maximum?
c. What is the maximum percent of the population on campus infected?

Score: /6
Problem 6: Suppose you were presented with the following contract for your signature:
Your firm offers to deliver 250 tables to a dealer, at $\$ 160 /$ table, and to reduce the price per table on the entire order by 50 cents for each additional table over 250.

Find the dollar total involved in the largest possible transaction between the manufacturer and the dealer; then find the smallest possible dollar amount and explain whether you should sign this contract.

Problem 7: Bobby is biking north at $8 \mathrm{~m} / \mathrm{s}$, heading for a railway crossing. A train is on the rails, moving west at $10 \mathrm{~m} / \mathrm{s}$. When Bobby is 12 m from the crossing, and the train is 16 m from the crossing, at what speed is the distance between Bobby and the train decreasing?


Score: /6
Problem 8: Let the model

$$
A(x)=0.003631 x^{3}-0.03746 x^{2}+0.1012 x+0.009
$$

approximate blood alcohol concentration in a 170 lb woman $x$ hours after drinking 2 oz of alcohol on an empty stomach, for $x$ in the interval [0,5]. Use linear approximation to approximate the change in alcohol level from 1 to 1.2 hours.

