

Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has five (5) pages, including this one.
- Enter your answer in the box(es) provided.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, or notes may be used on this test.
- An approved calculator may be used on this test.

Page	Max. points	Your points
2	16	
3	49	
4	13	
5	22	
Total	100	

Problem 1 (9 pts). Let $C(q)$ represent the cost and $R(q)$ represent the revenue, in dollars, of producing q items.

(a) If $C(50) = 4300$ and $C'(50) = 29$, estimate $C(52)$.

$$C(52) \approx$$

(b) If $C'(50) = 29$ and $R'(50) = 32$, approximately how much profit is earned by the 51st item?

The profit on the 51st item is \$

(c) If $MC(100) = 34$ and $MR(100) = 32$, should the company produce the 101st item?

☐ yes

☐ no

Problem 2 (7 pts). Write the Leibniz notation for the derivative of the given function and include units.

An employees pay P (in dollars) for a week is a function of the number of hours worked, H .

☐ In Leibnitz notation the derivative is $\frac{dP}{dH}$ and the units are dollars per hour.

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Problem 3 (7 pts). The function $P(t)$, where t is the year, gives the population (in millions) of California. In 2011, the population was approximately 37,650,000 people, and $P'(2011) = 0.4$. The relative rate of change in the population in California in the year 2011 is

- ☐ $\frac{P(2011)}{P(2012)} \approx 0.989$
- ☐ $\frac{P'(2011)}{P(2011)} \approx 0.01$
- ☐ $\frac{P(2011)}{P'(2011)} \approx 94.125$
-

Problem 4. (7 pts each) Find the derivative of the following functions:

(a) $f(x) = \sqrt{\frac{1}{x^{39}}}$

$$f'(x) =$$

(b) $y = 6t^5 - 10\sqrt{t} + \frac{9}{t}$

$$y'(t) =$$

(c) $f(x) = \frac{x^8 + 2}{x}$

$$f'(x) =$$

(d) $f(x) = \ln(8 - e^{-x})$

$$f'(x) =$$

(e) $f(x) = (6 + \ln x)^{0.6}$

$$f'(x) =$$

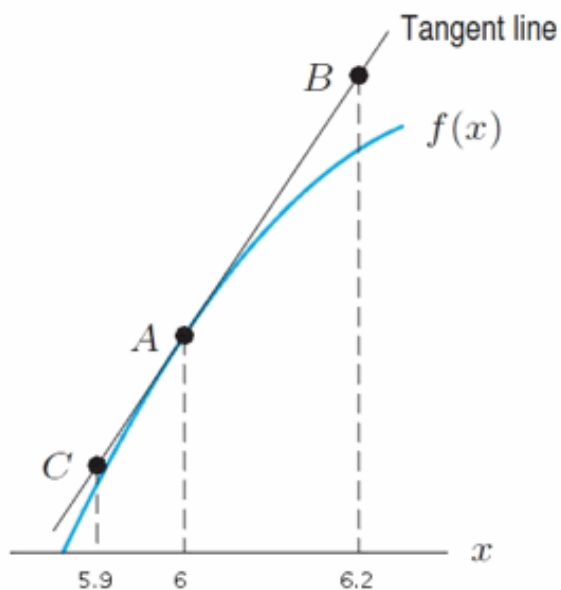
(f) $f(x) = 2e^{7x} + e^{-x^6}$

$$f'(x) =$$

Problem 5 (7 pts). Find an equation for the tangent line to the graph of $f(x) = (2x^2 - 1)(3x + 4)$ at $x = 0$.

 $y =$

Problem 6 (6 pts). The function in the figure below has $f(6) = 31$ and $f'(6) = 2.1$. Find the coordinates of the points A , B and C .



$A = (\quad , \quad), \quad B = (\quad , \quad), \quad C = (\quad , \quad)$

Problem 7 (7 pts). The average weight W of an oak tree in kilograms that is x meters tall is given by the function $W = f(x)$. What are the units of measurement of $f'(x)$?

- ☐ The units of measurement of $f'(x)$ are kilograms/meter.
☐ The units of measurement of $f'(x)$ are meters²/kilograms².
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Problem 8 (8 pts). Given the following functions, indicate whether they are power functions. In case they are, find a suitable constant of proportionality k , and power p so you could write those functions in the form $f(x) = kx^p$.

$f(x)$	power function?	k	p
$5\sqrt{x}$			
17^x			
$(3x^5)^2$			
$\frac{5}{2\sqrt{x}}$			

Problem 9 (7 pts). Given the graph of the function $f(x)$ below (left), sketch the graph of the function $2 - f(2x)$.

