

Name (print): \_\_\_\_\_

Signature: \_\_\_\_\_

Section: \_\_\_\_ Z-number \_\_\_\_\_

1. (20 pts.) Evaluate the following derivatives. Don't simplify your answers.

(a)  $f(x) = \frac{1}{(x^3 + 3x^2 + 2)^2}$

$f'(x) =$

(b)  $f(x) = \ln \left\{ \frac{(x^3 + 3x^2)(5x^2 - 1)}{(3x + 2)} \right\}$

$f'(x) =$

(c)  $f(x) = \ln \left( e^{4x^2} \cdot \sqrt{(x^2 + 1)} \right)$

$f'(x) =$

(d)  $f(x) = e^{(x^2+2x)} \cdot (5x - 2x^2 + 3)$

$f'(x) =$

2. (15 pts.) Find the equation of the tangent line to the curve  $y = (x - 1) \ln(x + 2)$  at the point  $x = -1$ .

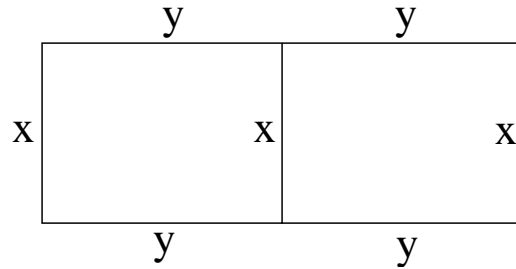
3. (15 pts.) The population of a colony of bacteria after  $t$  hours is given by  $P(t) = 100e^{7t}$

(a) Find the growth rate of the population after 10 hours.

(b) At what time will the population double?

(c) How large will the population of the colony of bacteria be after 10 hrs.?

4. (15 pts.) A construction company has 840 ft. of chain-link fence that is used to enclose storage areas for materials at construction sites. The supervisor wants to setup two identical rectangular storage areas sharing a common fence (see the figure).



Assuming that all fencing is used:

- (a) Express total area  $A(x)$  enclosed by both pens as a function of  $x$ .
- (b) Find the value of  $x$  that will maximize  $A(x)$  (area).
- (c) What is the largest total area that can be enclosed.

5. (15 pts.) 20 gms of a certain radioactive material decays to 10 gms in 10 days. After how many days will just 6 gms remain?

$$[\ln(.5) = -.693; \ln(.3) = -1.204]$$

6. (10 pts.) Compute the following integrals.

(a)  $\int \left( 2x^3 + 5x^3 + \frac{2}{x} + e^{-5x} \right) dx$

(b)  $\int \left( \frac{2x^4 + 3x^3 + 5}{x^4} \right) dx$

7. (10 pts.) Find  $f(x)$  where  $f'(x) = 3x^2 + 5x + 2$  and  $f(0) = 1$ .