

Please show all work for full credit.

1. (5 pts) Find antiderivatives F of the following functions.

A. $f = 4x^3 - 4x + 4$. Find an antiderivative F satisfying $F(2) = 19$.

B. $f = 7 \cdot \sqrt[3]{x^7} - \frac{3}{x^{2.5}} + 4(2x - 3)^7 + \frac{5}{x}$. Find a general antiderivative F .

2. (5 pts) A quick young frog on Pelimar (an imaginary planet) where the acceleration of gravity is -4 feet per sec^2 , jumps vertically upward with an initial velocity of 10 feet per second, from the top of a 28 foot hill above a pond.

a. Determine its velocity $v(t)$ and position $s(t)$ as a function of time. Please include units in your answer.

Ans. $v(t) =$ _____ **Ans.** $s(t) =$ _____

b. When is the frog highest? How high is it above the pond then?

Ans. $t =$ _____

c. When does the frog pass an osprey's nest on a platform 6 feet above the top of the hill?

Ans. $t =$ _____ and $t =$ _____.

d. The frog lands on a lily pad floating on the pond. When does it land? What is its velocity then?

Ans. $t =$ _____, $v =$ _____

d*. Discuss whether the frog gets wet.

3. (3 pts) The concentration of a medicine in the body is $f(x) = 9xe^{-0.5x}$ ng/ml, x hours after a shot.

a. Determine when the concentration is maximum, and also the maximum concentration.

b. If the effective concentration is 3 ng/ml, determine the interval of time during which the medicine is effective (you will need your graphing calculator for this part).

c. If a second dose is to be given so that it becomes effective when the first dose just ceases being effective, when should the second dose be given?

4A. A farmer is planning to build four pens in a row against a barn, using 600 feet of fence. Let x be the total length of the row, and y the depth of the pens. What are the dimensions x, y that maximize the area.

4B. Dually, the farmer builds four pens in a row, to enclose 1000 square feet. What length of row and depth of each pen minimizes the amount of fence used?

4C. The yield per apple tree (at maturity) is 12 bushels if there are 20 trees in a 600 by 1200 foot plot, and decreases by 0.8 bushels per tree, for each additional 2 trees added. What number of trees in the plot will (at maturity) yield the most apples?

4* EC (2 pts) A car is traveling initially at 20 fps. What constant negative acceleration $a < 0$ (from braking) is needed for the car to travel exactly 50 feet before stopping?

Quadratic formula: $ax^2 + bx + c = 0$ has solution $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\int x^n dx = \frac{x^{n+1}}{n+1} + C$ if $n \neq -1$, $\int x^{-1} dx = \ln(x) + C$, $\int b^x dx = \frac{b^x}{\ln(b)} + C$, $\int e^{ax} = \frac{1}{a} e^{ax} + C$

$\int \sin(ax) = -\frac{1}{a} \cos(ax)$, $\int \cos(ax) = \frac{1}{a} \sin(ax)$