

Directions: For full credit, show all work in the space provided in this package. Any scrap paper used should be attached. Neatness is expected and appreciated.

Part 1: Multiple Choice

For problems 1 and 2, differentiate.

1. $f(t) = \frac{-4}{(t^2 - 2)}$

a. $f'(t) = \frac{4}{(t^2 - 2)^2}$

b. $f'(t) = \frac{8t}{(t^2 - 2)^2}$

c. $f'(t) = \frac{-8t}{(t^2 - 2)^2}$

d. $f'(t) = \frac{8t(t^2 - 2)}{(t^2 - 2)^2}$

2. $y = \ln \frac{(6 + 2x^2)^8}{\sqrt[5]{5 + 2x}}$

a. $\frac{dy}{dx} = \frac{16}{3 + x} - \frac{2}{5(5 + 2x)}$

b. $\frac{dy}{dx} = \frac{16x}{3 + x^2} - \frac{2}{5 + 2x}$

c. $\frac{dy}{dx} = \frac{32x}{6 + 2x^2} - \frac{10}{5 + 2x}$

d. $\frac{dy}{dx} = \frac{32x}{6 + 2x^2} - \frac{2}{5(5 + 2x)}$

For problem 3, solve.

3. One side of an animal pen is to be formed by the side of a barn. If you have enough material to build a total of 34 feet of fence, find the maximum area that can be enclosed.

- a. 124.3 ft^2 b. 144.5 ft^2 c. 119.9 ft^2 d. 151.7 ft^2

Part 2: Open Response

4. Given: $\tan x = \frac{\sin x}{\cos x}$, find: $\frac{d}{dx} \tan x$

5. The surface area A and volume V of a spherical balloon are related by the equation

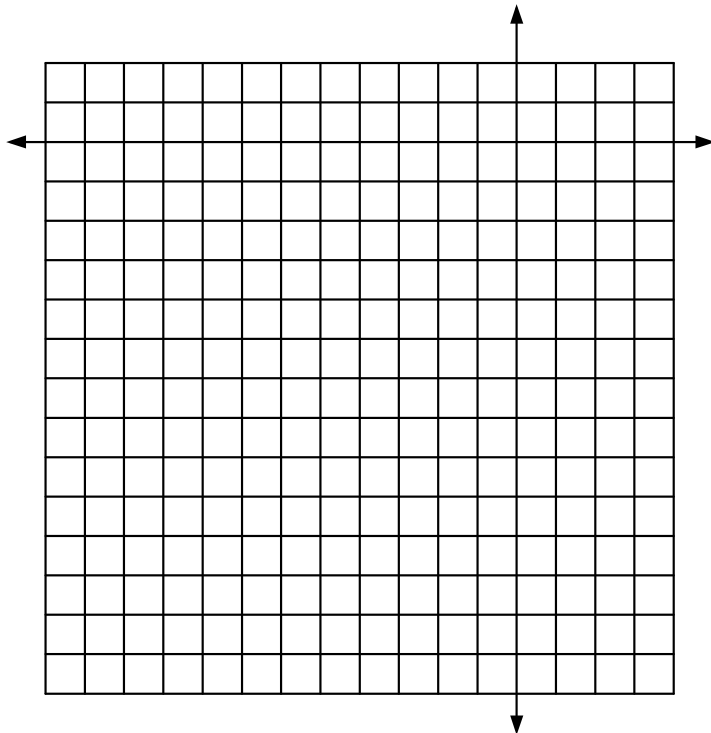
$$A^3 = 36\pi V^2$$

where A is in square inches and V is in cubic inches. If a balloon is being inflated with gas at the rate of 18 cubic inches per second, find the rate at which the surface area of the balloon is increasing at the instant the area is 153.24 square inches and the volume is 2781.35 cubic inches. (Use $\pi = 3.14$ to approximate the result.)

6. Use the **first derivative** $f'(x) = 6x^2 + 66x + 168$ and $f(2) = 488$ to answer each questions below.

a. Solve for $f(x)$, the original function

b. Sketch a graph of $f(x)$



c. Use calculus to find each of the following and place both in the space provided below and on your sketch.

i. the critical max/min points

Max:

Min:

ii. the inflection points

iii. the intervals over which the function increases

iv. the intervals over which the function decreases

v. the intervals over which the function is concave up/down