

Direction Read each question and evaluate the answers. Try doing your work on a separate piece of paper.

1. A spherical balloon is being inflated. What is the volume of the sphere at the instant when the rate of increase of the surface area is four times the rate of increase of the radius of the sphere?

Solution 8π cubic units

2. A camera on the ground is 100 m away from a model rocket launch pad. When the rocket is launched, it rises at a constant velocity of 20 m/s. How fast must the camera's angle change when the rocket is 100 m high?

Solution 5.7 deg/s

3. You have 500 ft of fence to enclose your children in a rectangular area. What are the dimensions of the fence that will give you the maximum area?

Solution length = 125 ft width = 125 ft

4. You want to make a box for your friend's birthday using a 4 cm by 8 cm card board. What is the length of the square that will yield the greatest volume?

Solution 0.85 cm

5. If z is a differentiable function and $z(5) = 10$ and $f'(z) = 2$, what is the approximate value of $z(5.5)$?

Solution 11

6. What is the approximate value of $\cos 62^\circ$?

Solution 0.47

7. Find the critical point(s) of the function $f(x) = 4x^2 - 3x + 2$.

8. Given the cost function $C(x) = 500x + 6x + 0.2x^2$ and the revenue function $R(x) = 20x$, how many units should be produced to have the maximum profit?

HINT Profit can be found by using $R(x) - C(x)$

Solution $x = 35$

9. A plane lifts off from a runway at an angle of 30 degrees. If the speed of the plane is 500 $\frac{mi}{hr}$, then how fast is the plane gaining altitude?

Solution 250 $\frac{mi}{hr}$

10. Find two positive numbers that add up to 30 such that the maximum product is possible.

Solution 15 & 15

11. A snowball is placed under the sun. Its radius decreases at a rate of $\frac{1}{2}$ inch an hour. Find the rate of change of its volume at the instant the radius is 3 inches.

12. Find the local maximum, local minimum, absolute maximum, absolute minimum, & inflection point(s) of the following function $f(x) = \frac{x^2+4}{8x}$