



COMSATS University Islamabad, Islamabad Campus

Department of Physics
Mid Term Exam Fall 2023

Program : BPH/BEL
Semester: 1st
Subject : Calculus I

Total Marks: 25
Time Allowed: 80 minutes
Date: 6-11-2023

Teacher: Dr. Tanvir Akbar Kiani

Attempt all questions

Q.1 Find $\frac{d^2y}{dx^2}$ by implicit differentiation.

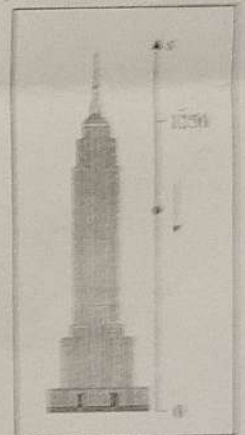
$$x \cos y = y$$

(5)

Q.2 An object is released from rest (its initial velocity is zero) from the Empire State Building at a height of 1250ft above street level (see figure). The height of the object can be modeled by the position function (5)

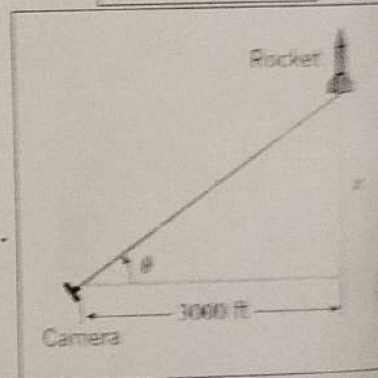
$$s = f(t) = 1250 - 16t^2.$$

- (a) Verify that the object is still falling at $t = 5s$.
- (b) Find the average velocity of the object over the time interval from $t = 5s$ to $t = 6s$.
- (c) Find the object's instantaneous velocity at time $t = 5s$.



- Q.3 As shown in the accompanying figure, a camera is mounted at a point 3000 ft from the base of a rocket launching pad. The rocket rises vertically when launched, and the camera's elevation angle is continually adjusted to follow the bottom of the rocket.
- (a) Express the height x as a function of the elevation angle θ .
 - (b) Find the domain of the function in part (a).

(5)



Q.4. Find the limits.

(a) $\lim_{x \rightarrow -\infty} \frac{e^x + e^{-x}}{e^x - e^x}$

(b) $\lim_{x \rightarrow 1} \frac{3x^2 - x - 2}{2x^2 + x - 3}$

Q.5 Find a value of the constant k , if possible, that will make the function continuous everywhere. (5)

32
436