Calculus I	**Name:**
Study Guide 17	**Class:**
Due Date:	**Score:**

No Work $\Leftrightarrow$ No Points

Use Pencil Only $\Leftrightarrow$ Be Neat & Organized

1. (4 points) Given $x^2 + y^2 = 2x + 4y$, $\dfrac{dx}{dt} = -5$, find $\dfrac{dy}{dt}$ when $x = 3$ and $y = 1$.

1. _____

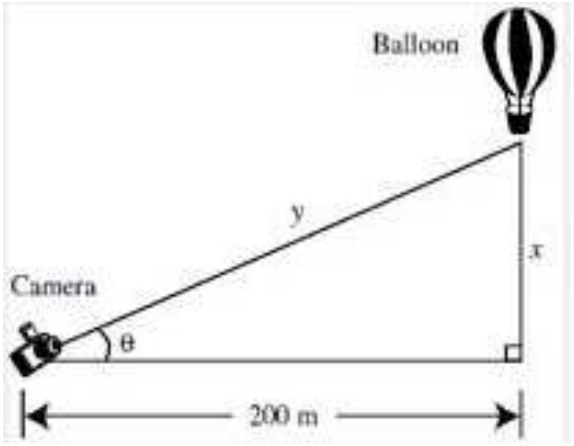
2. (4 points) A spherical balloon is inflated so its volume is increasing at the rate of 10 ft^3/min. How fast is the radius of the balloon increasing when the diameter is 4 ft?

2. _____

3. (4 points) An object is moving along the curve $\dfrac{xy^3}{y^2 + 4} = 1$. At what rate is the y–coordinate of the point $(1, 2)$ changing if its x–coordinate decreases at 6 units/sec.

3. _____

4. (4 points) Use the accompany figure. The balloon is rising vertically at the rate of 25 m/min. Find the rate of change for the distance between the camera and the balloon after 8 minutes the balloon took off.



4. _____

5. (4 points) Wheat is poured through a chute at the rate of 10 ft^3/min and falls in a conical pile whose bottom radius is always half the altitude. How fast is the circumference of the base be increasing when the pile is 8 ft high?

5. _____

6. (3 points) Find a linear approximation function for $\dfrac{1}{(1+2x)^5}$ with $a = 0$.

6. _____

7. (4 points) Let θ be an acute angle in a right triangle, and let find x and y, respectively, be the lengths of the sides adjacent to and and opposite θ. Suppose that x and y vary with time. At a certain instant, $x = 2$ and is increasing at 1 unit / s, while $y = 2$ and is decreasing at $\frac{1}{4}$ unit / s. how fast is θ changing at that moment?

7. _____

8. (4 points) A rocket, rising vertically, is tracked by a radar station that is on the ground 5 miles from the launchpad. How fast is the rocket rising when it is 4 miles high and its distance from the radar station is increasing at a rate of 2000 mi/h?

8. _____

9. (4 points) Find the slope of the tangent line to the curve $\sqrt[3]{x^2} + \sqrt[3]{y^2} = 4$ at the point $(-1, 3\sqrt{3})$.

9. _____

10. (5 points) A particle is moving along the curve $16x^2+9y^2 = 144$. Find all points (x, y) at which $\dfrac{dx}{dt} = \dfrac{dy}{dt}$, assume that they are never both zero at the same point.

10. _____

11. (10 points) Consider $f(x) = 4\sqrt[3]{x} - x\sqrt[3]{x}$, find all the points where the first and second derivatives are zero or undefined. Make sure to be organized and box all your answers.