

Review for Test Chapter 12-13

Covering Polar Eqs, Parametric Eqs, Circles, Ellipses, Hyperabola, and
Parabolas

- ① A kite flies according to the parametric equations:

$$x = t/8$$

$$y = -(3/64)x(t-128)$$

where t is measured in seconds and $0 < t \leq 90$

- A) How high is the kite above the ground at time $t=32$ seconds?
- B) At what rate is the kite rising at $t=32$ seconds?
- C) At what rate is the string being reeled out at $t=32$ seconds?
- D) At what time does the kite start to lose altitude? Justify

- ② Consider the cardioid

$$r = 1 - \cos \theta$$

- A) Sketch
- B) Find the area of the region in the 1st quadrant within the cardioid.
- C) Find the entire area within the cardioid.

- ③ A particle moves in the plane so that its x and y coordinates vary with time according to the equations.

$$x = \frac{1}{2}t^3 - 6t$$

$$y = \frac{1}{2}t^2$$

- A) Sketch the path of the particle over the interval $0 \leq t \leq 4$
- B) Represent the curve using only x and y . Eliminate the parameter, t
- C) Find dy/dx when $t = 4$

- ④ Consider the cardioid $r = 4 + 4 \cos \theta$ and the circle $r = 6$

- A) Sketch the 2 curves on one axes
- B) Find the area of the region that is inside the cardioid and outside the circle
Show \int and all steps that lead to your solution.

- ⑤ Consider the curve:

$$r = \frac{1}{2} + \cos \theta$$

- A) Sketch the limaçon
- B) Find the area of the region in the loop

6. The path of a particle is given for time $t > 0$ by the parametric equations:

$$y = 3t^2 \text{ and } x = t + \frac{2}{t}$$

- A) Find the coordinates of each point on the path where the velocity of the particle in the x direction is zero.
- B) Find dy/dx when $t=1$
- C) Find $\frac{d^2y}{dx^2}$ when $y=12$

7. Find the length of the curve of the cardioid

$$r = 1 + \sin \theta$$

- 8) A) What is the set of all values of b for which the graphs of $y = 2x + b$ and $y^2 = 4x$ intersect in 2 distinct points?
- B) In the case $b = -4$, find area of the region enclosed by $y = 2x - 4$ and $y^2 = 4x$.
- C) In the case $b = 0$, find the volume of the solid generated by revolving about the x-axis the region bounded by $y = 2x + 0$ and $y^2 = 4x$

- 9) A) A solid is constructed so that it has a circular base of radius r centimeters and every plane section perpendicular to a certain diameter of the base is a square, with a side of the square being a chord of the circle. Find Volume of the solid.
- B) If the solid described in part (A) expands so that the radius of the base increases at a constant rate of $\frac{1}{2}$ cm per minute, how fast is the volume changing when the radius is 4 cm.

AP Category # 14

A particle moves along the curve defined by the equation $y = x^3 - 3x$. The x -coordinate of the particle, $x(t)$, satisfies the equation $\frac{dx}{dt} = \frac{1}{\sqrt{2t+1}}$, for $t \geq 0$ with initial condition $x(0) = -4$.

- (a) Find $x(t)$ in terms of t .
 - (b) Find $\frac{dy}{dt}$ in terms of t .
 - (c) Find the location of the particle at time $t = 4$.
 - (d) Find the speed of the particle at time $t = 4$.
 - (e) Find the total distance traveled from $0 \leq t \leq 3$.
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