SM 3H

Date: **Section:**

Objective:

Types of parent equations:

linear: $y = mx + b$ quadratic: $y = ax^x + bx + c$

circle: $(x-h)^2 + (y-k)^2 = r^2$ parametric: $x = f(t), \quad y = g(t)$

Writing Parametric Equations for Line Segments

1. Write both parametric equations as linear functions: $x = m_1 t + b_1$, and $y = m_2 t + b_2$.
2. Substitute *x* and *t* values into the *x* equation to create a system of equations you can solve for m_1 and b_1.
3. Substitute *y* and *t* values into the *y* equation to create a system of equations you can solve for m_2 and b_2.

Examples:

Write parametric equations for the line segment starting at $(1,2)$ with $t = 0$ and ending at $(8,10)$ with $t = 1$.

Write parametric equations for the line segment starting at $(-2,4)$ with $t = 3$ and ending at $(5,-9)$ with $t = 7$. This type will be done in calculus, where the parameter doesn't start at 0.

Write parametric equations for the portion of the circle $x^2 + y^2 = 16$ that lies in the second quadrant.

Write parametric equations for the circle with center (-4, 1) and radius 5 and $0 \le t \le 2\pi$.

Writing Parametric Equations for a Polar Equation

Use the equations $x = r\cos\theta$ and $y = r\sin\theta$. Replace r to obtain the parametric equations. When converting polar equations to parametric equations, θ acts as the parameter.

Example: Write parametric equations for the polar equation $r = 3\cos\theta$.

The following problem involves the parametric equations for the path of a projectile.

$$x = v_0(\cos\theta)t \quad and \quad y = -16t^2 + v_0(\sin\theta)t + h_{0,}$$

where θ is the angle of inclination of the projectile at the launch, v_0 is the initial velocity of the projectile in feet per second, and h_0 is the initial height of the projectile in feet.

Ms. Gordon went to a driving range where there are 3 levels with 5 spots across on each level. She hit a golf ball with an initial speed of 80 feet per second at an angle of 60° to the horizontal. She was on the second level which is 10 feet above the ground.

a) Find the parametric equations that describe the position of the ball as a function of time.

b) How long is the ball in the air?

c) When is the ball at its maximum height? Determine the maximum height of the ball.

d) Determine the distance the ball traveled.