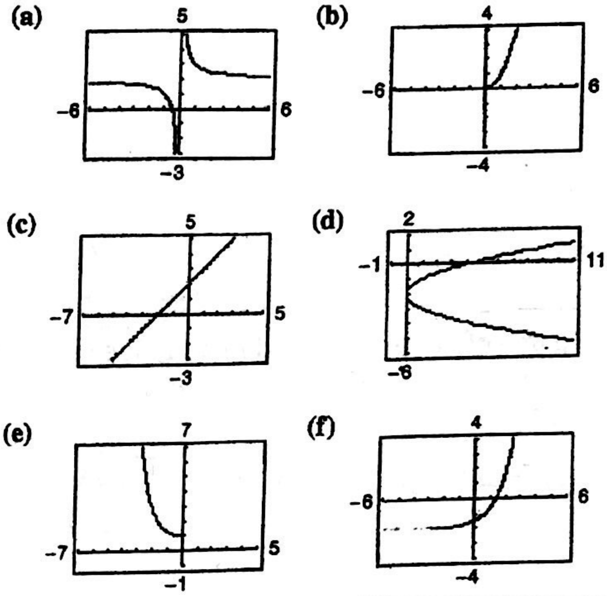
**Honors Pre-Calc**
**Practice 6.3**

Name Key
Date 19-20 Block

***Match the set of parametric equations with its graph.***




**1.** $x = t$, $y = t + 2$ C

**2.** $x = t^2$, $y = t - 2$ D

**3.** $x = \sqrt{t}$, $y = t$ B

**4.** $x = \frac{1}{t}$, $y = t + 2$ A

**5.** $x = \ln t$, $y = \frac{1}{2}t - 2$ F

**6.** $x = -2\sqrt{t}$, $y = e^t$ E

***Eliminate the parameter and state the domain restriction if one exists:***

7. $x = t^2 - 4$, $y = \frac{1}{2}t$

$2y = t$

$x = 4y^2 - 4$

parabola opens right

$V(-4, 0)$

Domain: $[-4, \infty)$

8. $x = 2t + 5$, $y = t^2$, $0 \le t \le 10$

$t = \frac{1}{2}x - \frac{5}{2}$

$y = (\frac{1}{2}x - \frac{5}{2})^2$

$x \in [5, 25]$

part of a parabola

9. $x = -1 + 3\cos\theta$, $y = 2 + 4\sin\theta$, $0 \le t \le 2\pi$

$\frac{x+1}{3} = \cos\theta$ $\frac{y-2}{4} = \sin\theta$

$\frac{(x+1)^2}{9} + \frac{(y-2)^2}{16} = 1$

Ellipse

$C(-1, 2)$

Domain: $[-4, 2]$

10. Jack hits a ball when it is 4 ft above the ground with an initial velocity of 120 ft/sec. The ball leaves the bat at a 30° angle with the horizontal and heads toward a 30 ft fence 350 feet from home plate. (44)

a) Write a set of parametric equations for the path of the baseball.

$x = 120\cos 30t$

$y = -16t^2 + 120\sin 30t + 4$

b) Does the ball clear the fence?

$\frac{350}{120\cos 30t} = \frac{120\cos 30t}{120\cos 30t}$

$t = 3.367876$

$y = -16(\text{ANS})^2 + 120\sin 30(\text{ANS}) + 4$

$y = 24.59$ ft.

c) Is so, by how much does the ball clear the fence? If not, could the ball be caught?

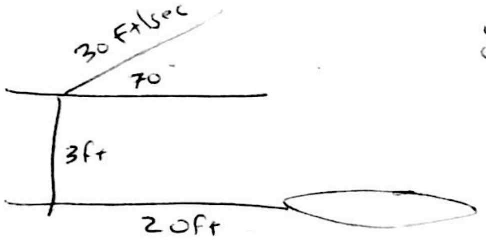
– doesn't clear the fence

– cannot be caught – too high

**11. Tony and Sue are launching lawn darts 20 feet from the front edge of a circular target of radius 18 inches on the ground. If Tony throws the dart directly at the target, and releases it 3 feet above the ground with an initial velocity of 30 ft/sec at a 70 degree angle, will the dart hit the target? [47]**

$x = 30\cos 70 t$

$y = -16t^2 + 30\sin 70 t + 3$




$\frac{20}{30\cos 70} = \frac{30\cos 70 t}{30\cos 70}$

$t = 1.9492$

$y(ANS) = -2.8407$

* Does not hit the target. Lands BEFORE the target.

**12. In the game of darts described in #11, Sue releases the dart 4 feet above the ground with an initial velocity of 25 ft/sec at a 55 degree angle. Will the dart hit the target? [48]**

$x = 25\cos 55 t$

$y = -16t^2 + 25\sin 55 t + 4$


$\frac{20}{25\cos 55} = \frac{25\cos 55 t}{25\cos 55}$

$t = 1.3948$

$y(ANS) = 1.4374$

$\frac{23}{25\cos 55} = \frac{25\cos 55 t}{25\cos 55}$

$t = 1.60397$

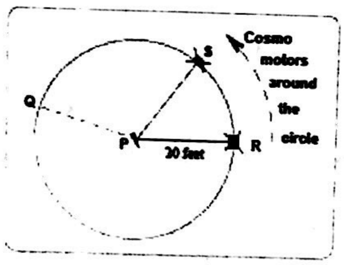
$y(ANS) = -4.3162$

YES! Hits the target

**13. Cosmo the dog is tied to a 20 foot long tether. Assume Cosmo starts at the location "R" in the Figure and maintains a tight tether, moving around the circle at a constant angular speed of $w = \pi/5$ radians/second. Parametrize Cosmos motion and determine where the dog is located after 3 seconds and after 3 minutes.**

$x = 20\cos\left(\frac{\pi}{5}t\right)$

$y = 20\sin\left(\frac{\pi}{5}t\right)$

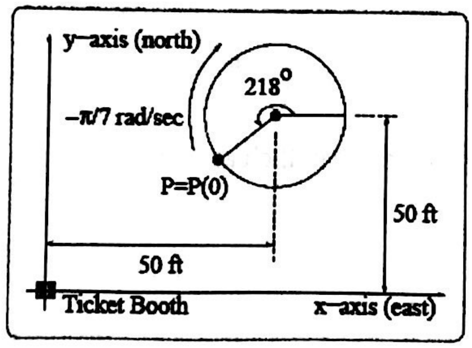



$T = 3$ $(-6.18, 19.02)$ $T = 180$ $(20, 0)$

**14. A rider jumps on a merry-go-round of radius 20 feet at the pictured location. The ride completes one entire rotation in 14 seconds. The center of the platform is located 50 feet east and 50 feet north of the ticket booth for the ride. What are the parametric equations describing the location of the rider? Where is the rider after 18 seconds have elapsed? How far from the ticket booth is the rider after 18 seconds have elapsed?**

$\omega = \frac{-\pi}{7}$ rad/sec

$218° \left| \frac{\pi \text{ rad}}{180°} \right| = \frac{109\pi}{90}$




$x = 20\cos\left(\frac{109\pi}{90} - \frac{\pi}{7}t\right) + 50$

$y = 20\sin\left(\frac{109\pi}{90} - \frac{\pi}{7}t\right) + 50$

$t = 18$, $(41.5, 68.1)$

$d(18) = \sqrt{41.5^2 + 68.1^2} = 79.75$ ft

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15. The quarterback of a football team releases a pass at a height of 7 feet above the playing field, and the football is caught by a receiver at a height of 4 feet, 30 yards directly downfield. The pass is released at angle of 35° with the horizontal.

a) Write a set of parametric equations for the path of the football.

$X = V_0 \cos 35 t$

$y = -16t^2 + V_0 \sin 35 t + 7$

$$\frac{90}{\cos 35 t} = \frac{V_0 \cos 35 t}{\cos 35 t}$$

$$V_0 = \frac{90}{\cos 35 t}$$

$$4 = -16t^2 + \frac{90 \sin 35 t}{\cos 35 t} + 7$$

$t = 2.03$ sec

b) Find the speed of the football when it is released.

$90 = (V_0 \cos 35)(2.03)$

$v = 54.1$ ft/sec

c) Estimate the maximum height of the football.

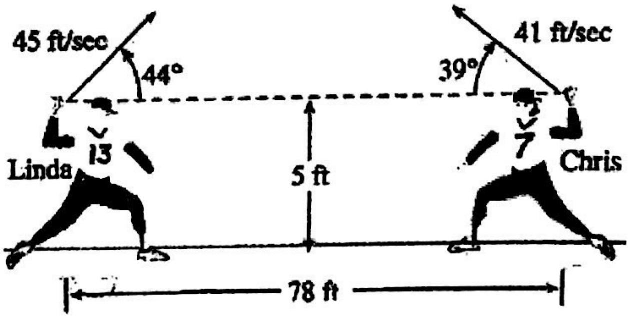
$$t = \frac{-b}{2a} \qquad \frac{-54.1 \sin 35}{-32} = .9697 \text{ sec}$$

$y(.9697) = 22$ feet

d) Find the time the receiver has to position himself after the quarterback releases the football.

$$\frac{90}{54.1 \cos 35} = \frac{\cancel{54.1 \cos 35}\, t}{\cancel{54.1 \cos 35}} \qquad t = 2.03 \text{sec}$$

16. Chris and Linda warm up in the outfield by tossing softballs to each other. Suppose both tossed a ball at the same time from the same height, as illustrated in the figure. Find the minimum distance between the two balls and when this minimum distance occurs. [46]




$X = 45 \cos 44 t$

$y = -16t^2 + 45 \sin 44 t + 5$

$x = 78 - 41 \cos 39 t$

$y = -16t^2 + 41 \sin 39 t + 5$

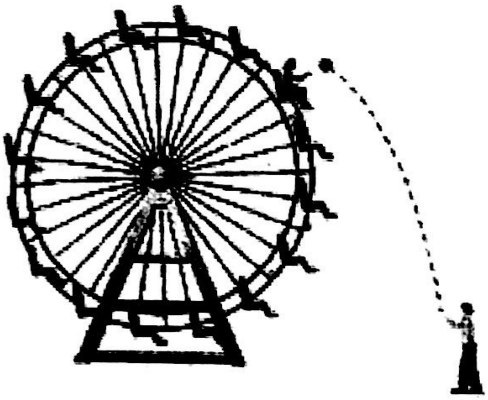
∗ Use distance formula in calculator. ∗

Minimum: (1.2056, 6.603)

at $t = 1.2056$ seconds

$d = 6.6$ feet

17. A Ferris wheel with a 71-foot radius turns counterclockwise one revolution every 20 seconds. Tony stands at a point 90 feet to the right of the base of the wheel. At the instant Matthew is at a point parallel to the ground, Tony throws a ball toward the Ferris wheel with an initial velocity of 88 ft/sec at an angle of 100 degrees with the horizontal.



a.) Write a set of parametric equations that model the ball's path.

$x = 90 - 88\cos 80t$

$y = -16t^2 + 88\sin 80t$

b.) Write a set of parametric equations that model Matthew's path.

$x = 71\cos(\pi/10\, t)$

$y = 71\sin(\pi/10\, t) + 71$

$\frac{\pi}{10} = 18^\circ$

c.) Find the minimum distance between the ball and Matthew.

- Use distance formula in calculator
- Make sure all equations are in same form
  - all radian or all degrees

$t = 2.1891$ seconds $d = 3.46797$ feet

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