Warm up
Work on Pre-Calculus Parametrics Worksheet (back)

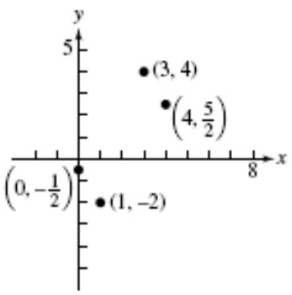
#10 a,b,c and 11 a,b,c

try 12a and 13a

5. (a)

t	-2	-1	0	1	2
x	0	1	2	3	4
y	$-\frac{1}{2}$	-2	undef.	4	$\frac{5}{2}$

(b)



12. $t = y - 5$, so $x = 2 - 3(y - 5)$; $y = -\frac{1}{3}x + \frac{17}{3}$: line through $\left(0, \frac{17}{3}\right)$ and $(17, 0)$

14. $t = y - 2$, so $x = 5 - 3(y - 2)$;
$y = -\frac{1}{3}x + \frac{11}{3}$, $-4 \le x \le 8$: line segment with endpoints $(8, 1)$ and $(-4, 5)$

23. $x^2 + y^2 = 25$, circle of radius 5 centered at $(0, 0)$

24. $x^2 + y^2 = 16$, circle of radius 4 centered at $(0, 0)$

25. $x^2 + y^2 = 4$, three-fourths of a circle of radius 2 centered at $(0, 0)$ (not in Quadrant II)

32. One possibility is $x = -2 + 2\cos t$, $y = -4 + 2\sin t$, $0 \le t \le 2\pi$.

Finding Parametric equations from rectangular

Remember how to find parametric to rectangular:

$x = 4\cos(\theta) - 2$
$y = \sin(\theta) + 5$

$$\frac{(x+2)^2}{16} + \frac{(y-5)^2}{1} = 1$$

Finding Parametric equations from rectangular

$$\frac{x^2}{25} + \frac{y^2}{36} = 1$$

$x = 5\cos\theta$

$y = 6\sin\theta$

$$\frac{x^2}{144} + \frac{y^2}{100} = 1$$

$x = 12\cos\theta$

$y = 10\sin\theta$

Finding Parametric equations from rectangular

$$\frac{(x-3)^2}{25}+\frac{(y-9)^2}{9}=1$$

$x = 5\cos\theta + 3$

$y = 3\sin\theta + 9$

$x = 9\cos(\theta) - 3$

$y = 4\sin(\theta) - 4$

$$\frac{(x+3)^2}{81}+\frac{(y+4)^2}{16}=1$$

Writing a rectangular in parametric form

State the parametric equation for: $\mathbf{y = 2x^2 - 2x}$

given $\mathbf{t = 1 + x}$ as one parameter.

$x = t$

$y = 2t^2 - 2t$

$x = t - 1$

$y = 2(t-1)^2 - 2(t-1)$

$2t^2 - 4t + 2 - 2t + 2$

$y = 2t^2 - 6t + 4$

Projectile motion with Parametric equations

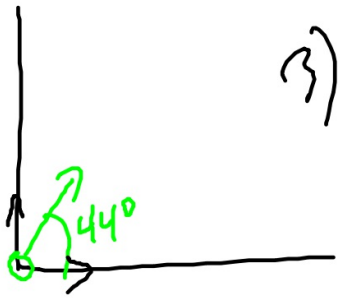
Find the initial horizontal and vertical velocity for each situation.

1. a soccer ball kicked with an initial velocity of 39 feet per second at an angle of 44° with the ground

$x = 39\cos 44$

$y = 39\sin 44$

$x = 28.05$ ft/s $y = 27.09$ ft/s



3) $x = 5.34$ m/s

$y = 8.48$ m/s

2. a toy rocket launched from level ground with an initial velocity of 63 feet per second at an angle of 84° with the horizontal

$X = 6.59$ ft/s

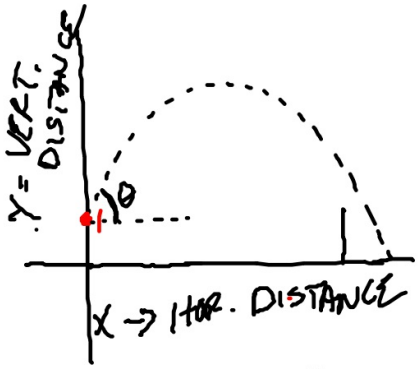
$Y = 62.65$ ft/s

MODELING PROJECTILE MOTION

The object's parabolic path can be modeled with the parametric equations

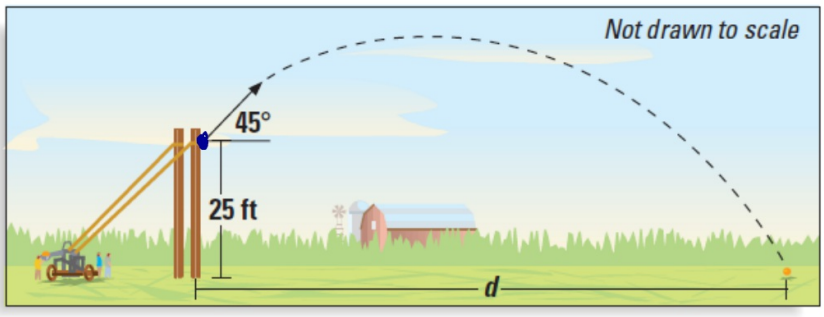
$$x = (v \cos \theta)t + x_0$$

$$y = -\frac{1}{2}gt^2 + (v \sin \theta)t + y_0$$



The constant g is the acceleration due to gravity. Its value is 32 ft/sec^2 or 9.8 m/sec^2.

PUMPKIN TOSSING In a pumpkin tossing contest in Morton, Illinois, a contestant won the catapult competition by using two telephone poles, huge rubber bands, and a power winch. Suppose the pumpkin was launched with an initial speed of 125 feet per second, at an angle of 45°, and from an initial height of 25 feet.



a. Write a set of parametric equations for the motion of the pumpkin.

b. Use the equations to find how far the pumpkin traveled.

$$x = (v \cos \theta)t + x_0 \qquad y = -\frac{1}{2}gt^2 + (v \sin \theta)t + y_0$$

$$\approx 88.4t \qquad \approx -16t^2 + 88.4t + 25$$

5. *Model Rocketry* Manuel launches a toy rocket from ground level with an initial velocity of 80 feet per second at an angle of 80° with the horizontal.

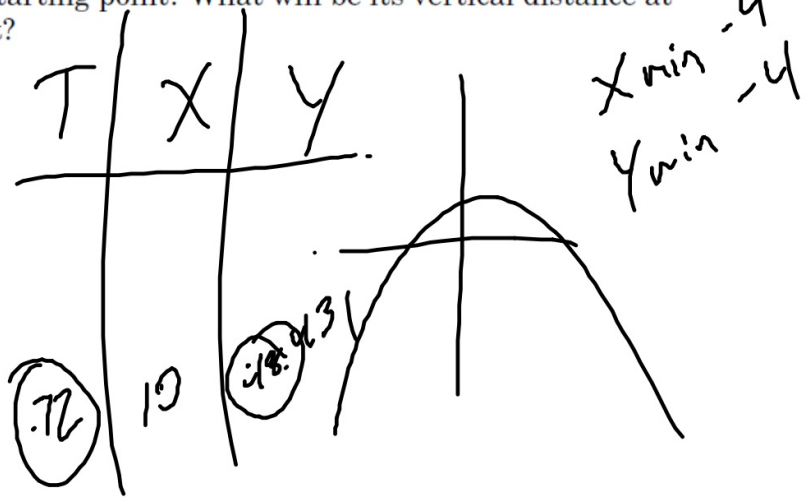
a. Write parametric equations to represent the path of the rocket.

$X = 80\cos(80)T$

$Y = -16T^2 + 80\sin(80)T$

Δtbl .05

b. How long will it take the rocket to travel 10 feet horizontally from its starting point? What will be its vertical distance at that point?



$X = 65\cos(45)T$

$Y = -16T^2 + 65\sin(45)T + 5$

x: 22.98

y: 23.98