WARM UP

- **REVIEW FROM MATH I**

1. SOLVE FOR THE INTERSECTION OF THE FOLLOWING SYSTEMS OF EQUATIONS BY SUBSTITUTION:

A.

$$\begin{cases} Y = x + 1 \\ Y + 7 = 2x \end{cases}$$

$x + 1 + 7 = 2x$

$x + 8 = 2x$

$-x \quad -x$

$8 = x$

$y = 8 + 1$

$y = 9$

$(8, 9)$

B.

$$\begin{cases} 2x + y = 4 \\ 7x + y = 9 \end{cases}$$

$(-1) \quad (-1) \quad (-1)$

$-2x \quad -y \quad = -4$

$5x \quad = 5$

$x = 1$

$(1, 2)$

$(2)(1) + y = 4$

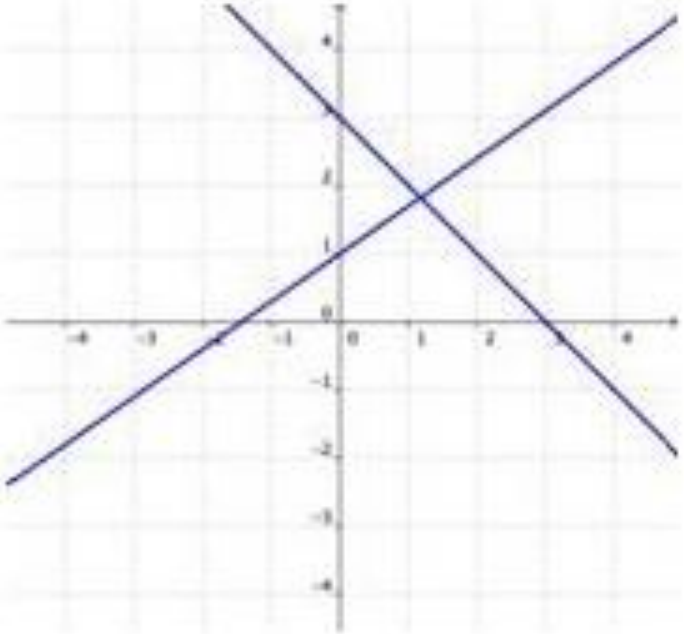
$2 + y = 4$

$y = 2$

ROUGH SKETCH THESE LINES AND LABEL THE POINT OF INTERSECTION.

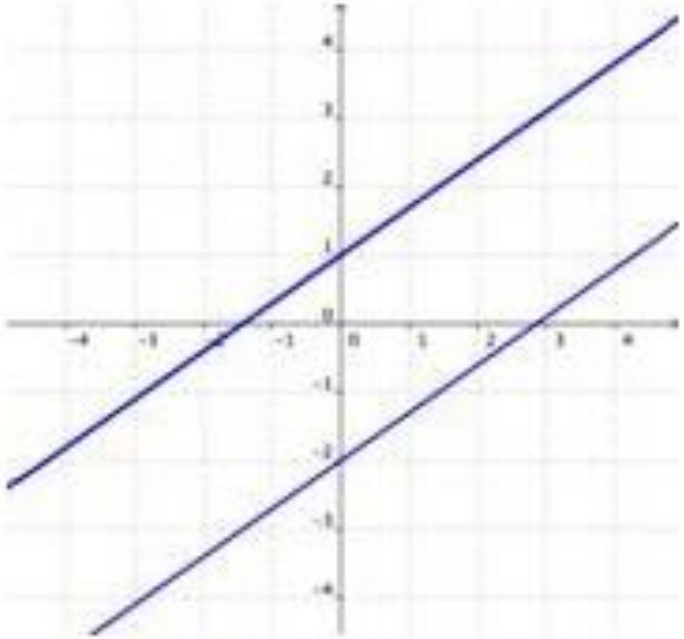
LINEAR SYSTEMS OF EQUATIONS

One Solution



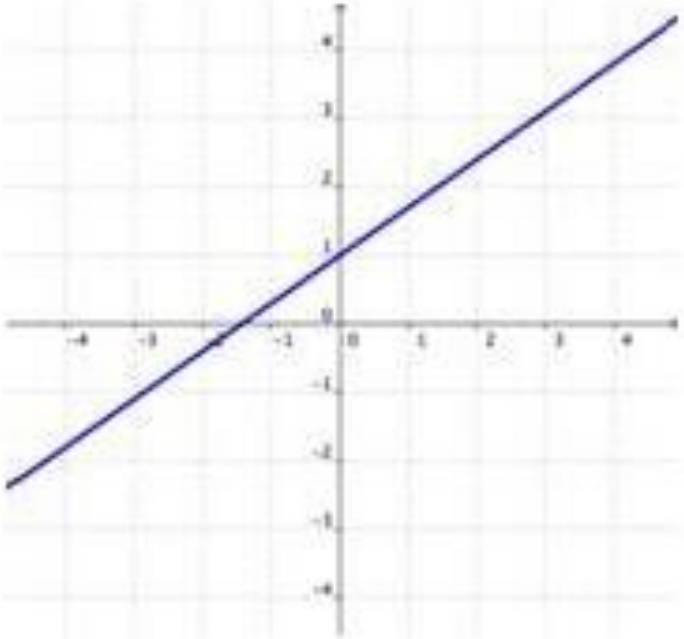
If the graphs of the equations intersect, then there is one solution that is true for both equations.

No Solutions



If the graphs of the equations do not intersect (for example, if they are parallel), then there are no solutions that are true for both equations.

Infinite Solutions



If the graphs of the equations are the same, then there are an infinite number of solutions that are true for both equations.

WARM UP

- **GRAPH THE FOLLOWING AND STATE THE NUMBER OF INTERSECTIONS, IF ANY.**

A.

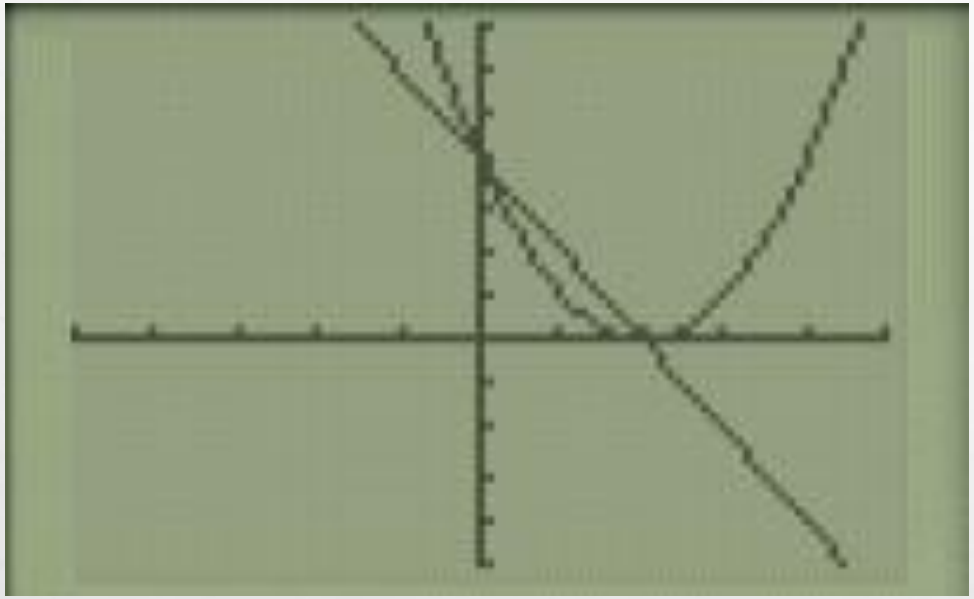
$$\begin{cases} \mathrm{Y} = x^2 + 1 \\ \mathrm{Y} = 2x + 7 \end{cases}$$

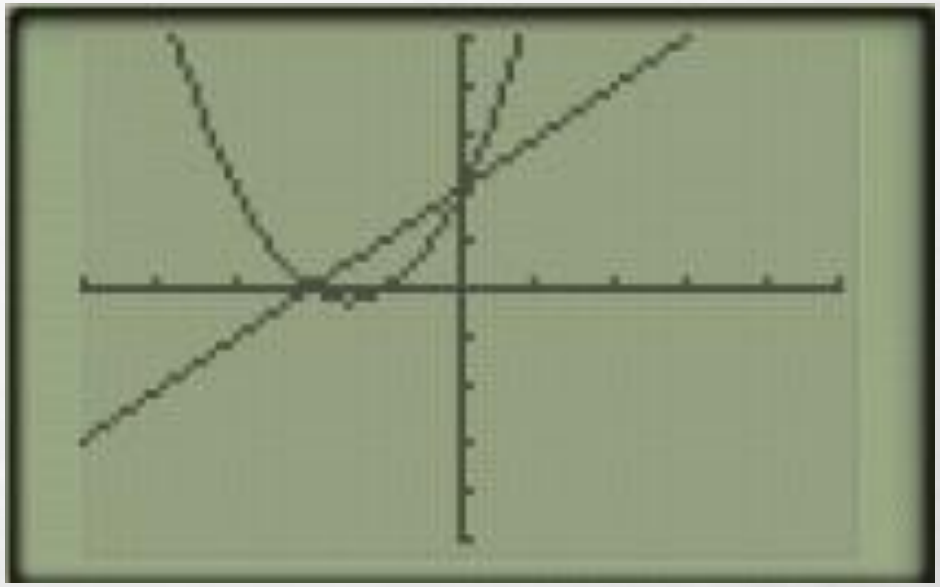
B.

$$\begin{cases} y = \mathrm{X}^2 + 4\mathrm{X} + 4 \\ y = 7x - 9 \end{cases}$$

HOMEWORK

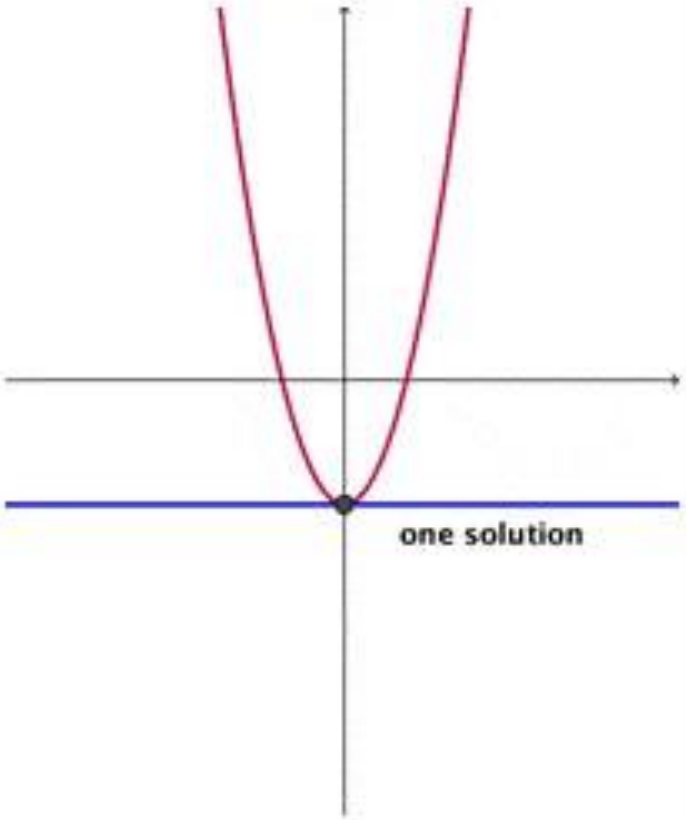
1.





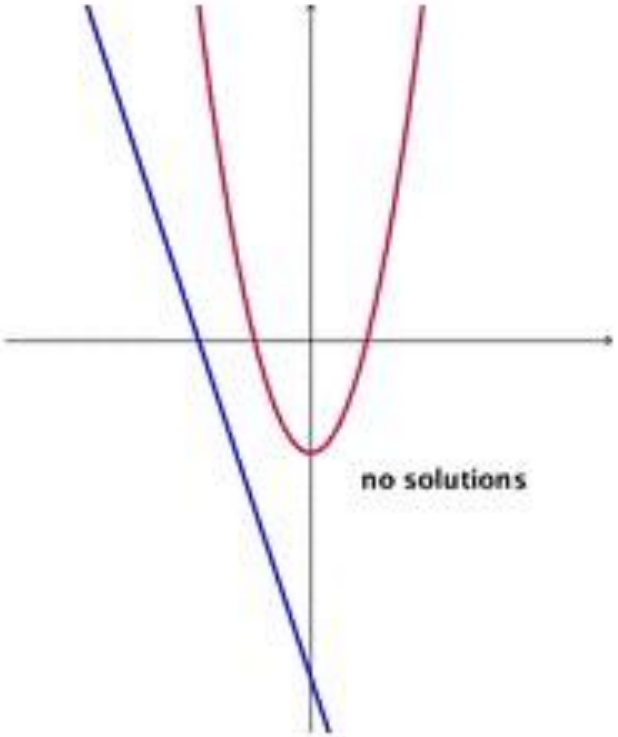
NONLINEAR SYSTEMS: PARABOLA AND

One Solution



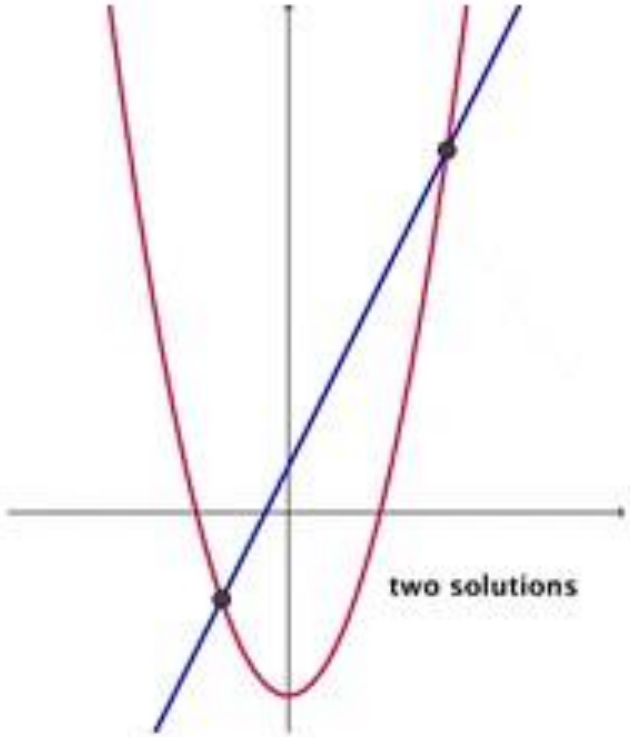
If the parabola and the line touch at a single point, then there is one solution that is true for both equations.

No Solutions



If the graphs of the equations do not intersect, then there are no solutions that are true for both equations.

Two Solutions



If the line intersects the parabola in two places, then there are two solutions that are true for both equations.

PRACTICE SOLVING

1.

$$\begin{cases} Y = x^2 - 2 \\ Y = 2x + 1 \end{cases}$$

$x^2 - 2 = 2x + 1$

$-2x - 1 \quad -2x - 1$

$x^2 - 2x - 3 = 0$

$-3, 1$

$(x-3)(x+1) = 0$

$x - 3 = 0$

$+3 \quad +3$

$x = 3$

$y = 2(3) + 1$

$y = 7$

$(3, 7)$

$x + 1 = 0$

$-1 \quad -1$

$x = -1$

$y = 2(-1) + 1$

$y = -1$

$(-1, -1)$

2.

$$\begin{cases} y = x^2 + 2x + 3 \\ y = 4x + 2 \end{cases}$$

$x^2 + 2x + 3 = \cancel{4x} + \cancel{2}$

$-4x \quad -2 \qquad -\cancel{4x} \quad -\cancel{2}$

$x^2 - 2x + 1 = 0$

$(x-1)(x-1) = 0$

$x - 1 = 0$

$+1 \quad +1$

$x = 1$

$y = 4(1) + 2$

$y = 6$

$(1, 6)$

3.

$$\begin{cases} y = x^2 - 2x - 1 \\ y = 3x - 10 \end{cases}$$

$x^2 - 2x - 1 = \cancel{3x} - \cancel{10}$

$-3x + 10 \qquad -\cancel{3x} + \cancel{10}$

$x^2 - 5x + 9 = 0$

$\dfrac{5 \pm \sqrt{(-5)^2 - 4(1)(9)}}{2(1)}$

$\sqrt{-11}$

$i\sqrt{11}$

$\dfrac{5 \pm i\sqrt{11}}{2}$

0 solutions

or

$\emptyset$

A ROCKET IS LAUNCHED FROM THE GROUND AND FOLLOWS A PARABOLIC PATH REPRESENTED BY THE EQUATION $Y = -X^2 + 10X$. AT THE SAME TIME, A FLARE IS LAUNCHED FROM A HEIGHT OF 10 FEET AND FOLLOWS A STRAIGHT PATH REPRESENTED BY THE EQUATION $Y = -X + 10$. WHEN AND AT WHAT HEIGHT DOES THE FLARE AND THE ROCKET MEET?

$$\cancel{-x^2} + \cancel{10x} = -x + 10$$
$$\cancel{+x^2} \quad -10x \quad +x^2 - 10x$$
$$0 = x^2 - 11x + 10$$
$$0 = (x-10)(x-1)$$
$$\cancel{x = 10} \qquad x = 1$$

$$y = -1 + 10$$
$$y = 9$$
$$(1, 9)$$

PRACTICE SOLVING: WORD PROBLEM

A SKEET IS LAUNCHED INTO THE AIR AT TIME $t = 0$, AND ITS TRAJECTORY CAN BE MODELED BY THE EQUATION:

$$\mathrm{H}(t) = -t^2 + 6t - 1$$

WHERE T IS TIME IN SECONDS AND H IS HEIGHT IN FEET. A COMPETITOR SHOOTS AT THE SKEET SEVERAL SECONDS LATER AND HER BULLET CAN BE MODELED BY:

$$b(t) = \frac{7}{4}t$$

DOES SHE HIT THE TARGET? IF SO, AT WHAT TIME AND AT WHAT HEIGHT?

U3 D2

WARM UP

SOLVE FOR INTERSECTIONS (IF ANY EXIST)

1. $Y = X^2 + 4X + 3$

$Y = 2X + 6$

$x^2 + 4x + 3 = 2x + 6$

$-2x - 6 \quad -2x - 6$

$x^2 + 2x - 3 = 0$

$(x+3)(x-1)$

$x = -3$

$y = 2(-3) + 6$

$y = 0$

$(-3, 0)$

$x = 1$

$y = 2(1) + 6$

$y = 8$

$(1, 8)$

2. $Y = -X^2 + 2X + 4$

$Y - 4 = 2X$

$-x^2 + 2x + \cancel{4} - \cancel{4} = 2x$

$-x^2 + 2x = 2x$

$-x^2 = 0$

$x = 0$

$y - 4 = 2(0)$

$y - 4 = 0$

$+4 \quad +4$

$y = 4$

$(0, 4)$

HOW MANY SOLUTIONS? (GRAPH)

3. $Y = X^2 + 4X + 3$

$Y = 2X + 6$

$\sqrt{y^2} = \sqrt{-x^2 + 25}$

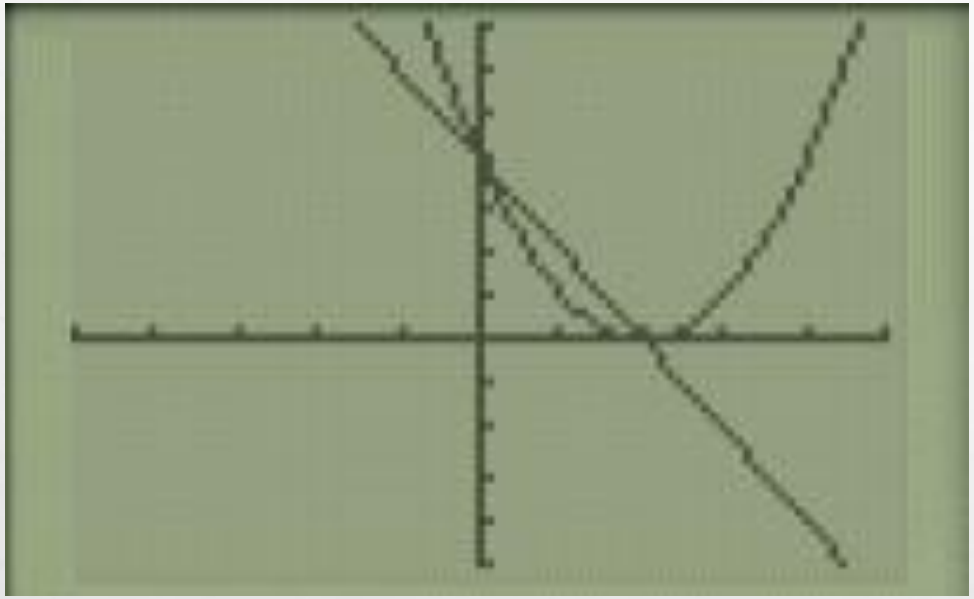
$y = \pm\sqrt{-x^2 + 25}$

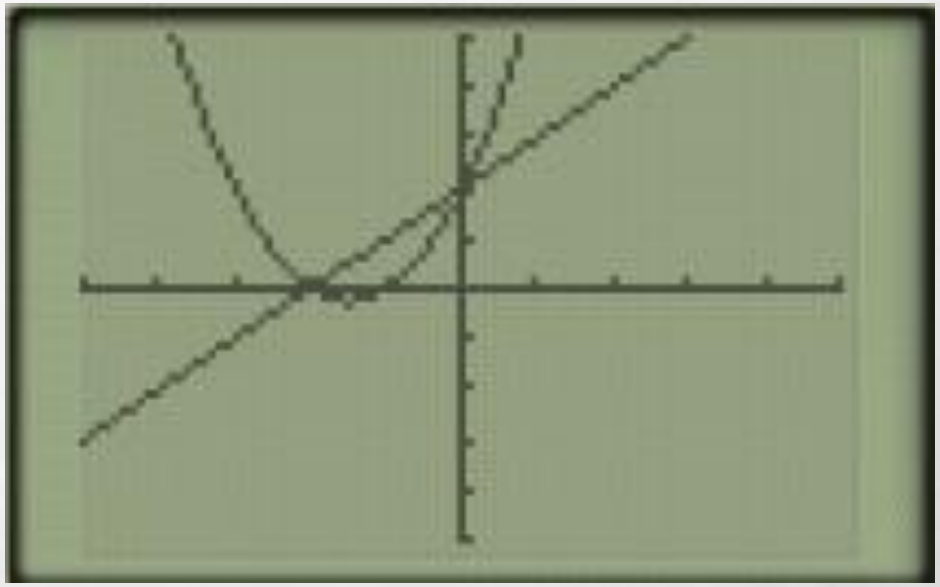
4. $x^2 + y^2 = 25$

$x - y = 5$

HOMEWORK

1.





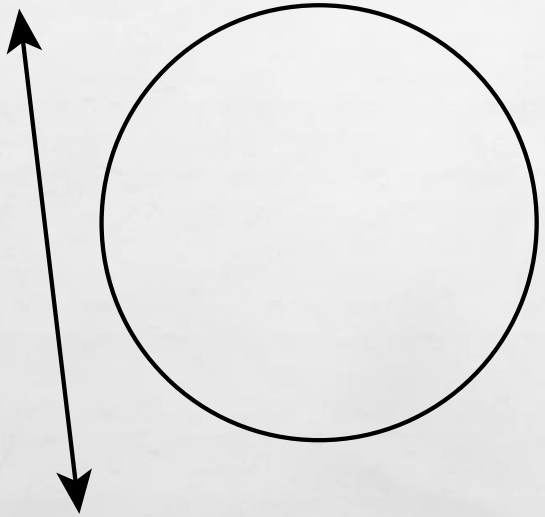
3. (2,5) AND (4,9) AND (3, -7)

4. (0,4)

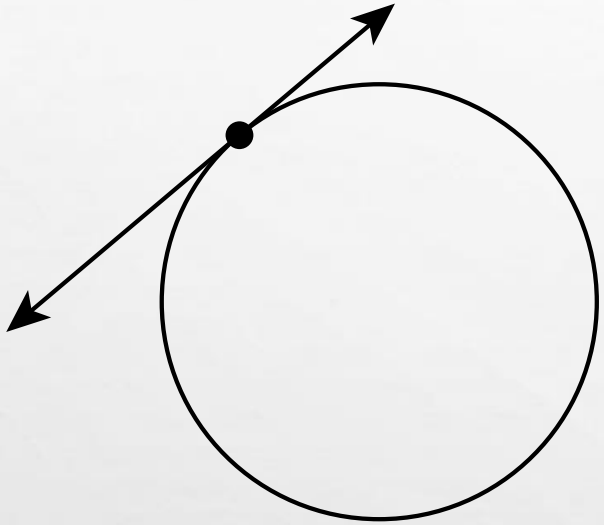
5A. PRICE: $5 PROFIT: $1000

5B. (1, 360) AND (10, 0)

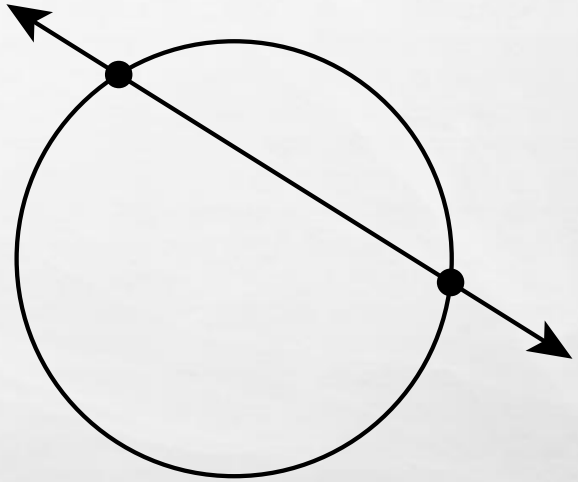
SYSTEM OF LINE AND CIRCLE



No real solution



One real solution



Two real solutions

SYSTEM OF LINE AND CIRCLE

1. $\begin{cases} x^2 + y^2 = 18 \\ y = x \end{cases}$

$x^2 + x^2 = 18$

$2x^2 = 18$

$\sqrt{x^2} = \sqrt{9}$

$x = 3$, $y = 3$, $(3,3)$

$x = -3$, $y = -3$, $(-3,-3)$

2. $\begin{cases} x^2 + y^2 = 50 \\ y = 5 \end{cases}$

$x^2 + (5)^2 = 50$

$x^2 + 25 = 50$

$x^2 = 25$

$x = 5$, $y = 5$, $(5,5)$

$x = -5$, $y = 5$, $(-5,5)$

3. $\begin{cases} x^2 + y^2 = 40 \\ y = 3x \end{cases}$

$x^2 + (3x)^2 = 40$

$x^2 + 9x^2 = 40$

$10x^2 = 40$

$x^2 = 4$

$x = 2$, $y = 3(2)$, $(2,6)$

$x = -2$, $(-2,-6)$

SYSTEM OF LINE AND CIRCLE

AN AIRPLANE MAKING ITS FINAL APPROACH TO AN AIRPORT CAN BE (VERY) ROUGHLY MODELED BY $X^2 + Y^2 = 4$. ANOTHER AIRPLANE IS TAKING OFF AND FOLLOWS FLIGHT PATH WITH EQUATION $Y=2X$. ASSUMING THE HEIGHTS OF THE AIRCRAFT ARE THE SAME, WILL THE AIRPLANES COLLIDE? IF SO, AT WHAT POSITION WILL THE PLANES BE?

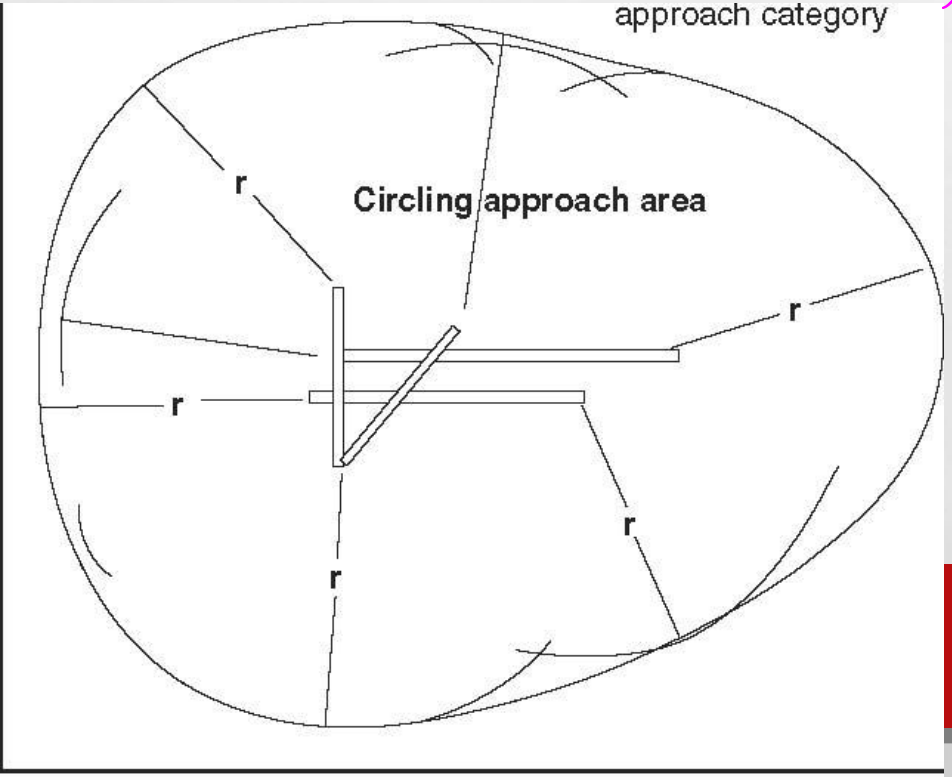


Figure 10-11. *Circling approach area radii*

$$x^2 + (2x)^2 = 4$$

$$x^2 + 4x^2$$

$$5x^2 = 4$$

$$x = \pm \frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$\frac{\pm 2\sqrt{5}}{5} = x$$

$$x^2 + y^2 = 4$$

$$y^2 = -x^2 + 4$$

$$y = \pm\sqrt{-x^2+4}$$

WARM UP

SOLVE FOR THE POINTS OF INTERSECTIONS.

1. $y = x^2 + 2x - 4$

$y^2 = 17$

$y = 2x + 5$

$y = 4x$

2. $x^2 +$