

Lines and coordinate review

Friday, September 18

Sections 2.4 and 2.5

Parallel and perpendicular line equations

Circle equations from points and diameters

Earlier algebra skills for Test 1

Today's roadmap

Three headings for your class notes

- 1** LINES
slope + point $\rightarrow$ equation $\rightarrow$
check
- 2** CIRCLES
center + radius $\rightarrow$ equation $\rightarrow$
check
- 3** MIXED REVIEW
problem type $\rightarrow$ method $\rightarrow$ check

My notes

Method

Worked example

Correction

Quiz 4 and Test 1

The revised assessment plan

Monday, Sep 21: Quiz 4 assigned as a take-home review.

Quiz 4 focuses on 2.4 and 2.5, with earlier topics included.

Wednesday, Sep 23: Test 1 at 2:10 PM; Quiz 4 due 3:15 PM.

Test 1 stops at 3.1. Any 3.1 topics are included.

ALEKS Sections 2.5 and 3.1 remain due Sep 23 at 2:10 PM.

Opening practice

4 minutes individually. Show each setup.

1. Find the slope of $3x + 2y = 12$.
2. Find a perpendicular slope to $y = -2x + 5$.
3. Write the line through $(-2, 5)$ and $(4, -7)$.

Opening practice: solutions

A slope and a point determine the line

1. $2y = -3x + 12$, so $m = -3/2$.

2. $m = 1/2$ because $(-2)(1/2) = -1$.

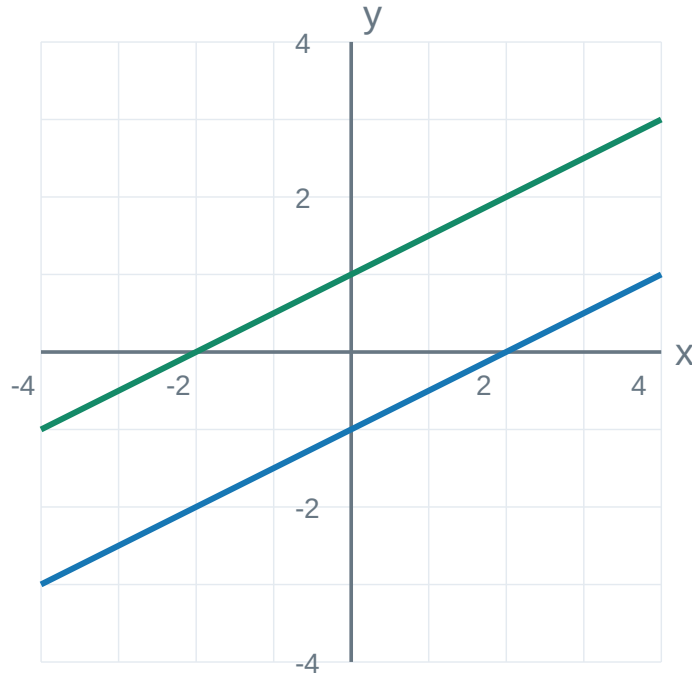
3. $m = (-7 - 5)/(4 + 2) = -2$

$$y - 5 = -2(x + 2), \text{ so } y = -2x + 1.$$

Parallel and perpendicular slopes

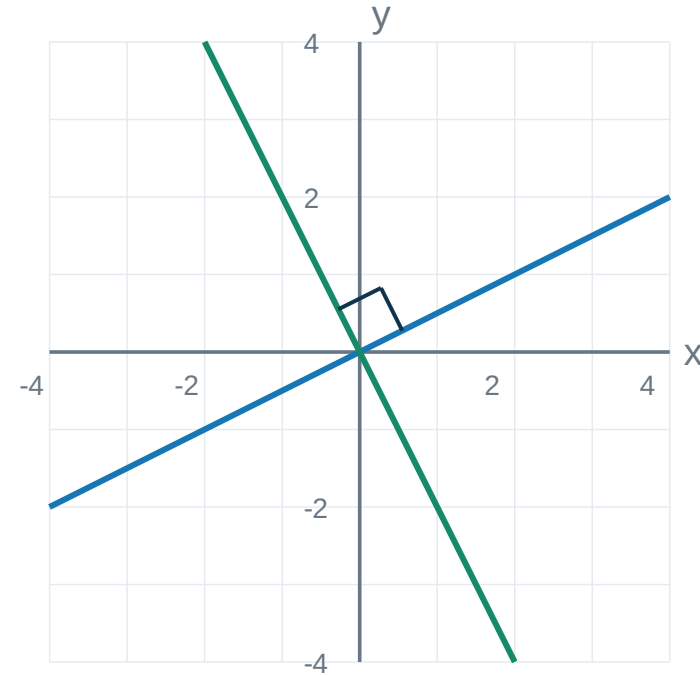
First solve the given equation for y

Parallel: equal slopes



$$m_1 = \frac{1}{2} \quad m_2 = \frac{1}{2}$$

Perpendicular: a right angle



$$m_1 = \frac{1}{2} \quad m_2 = -2$$

$$\frac{1}{2} \times (-2) = -1$$

Two lines through the same point

Given $3x + 2y = 12$ and $P = (2, -1)$

1 Find the given slope

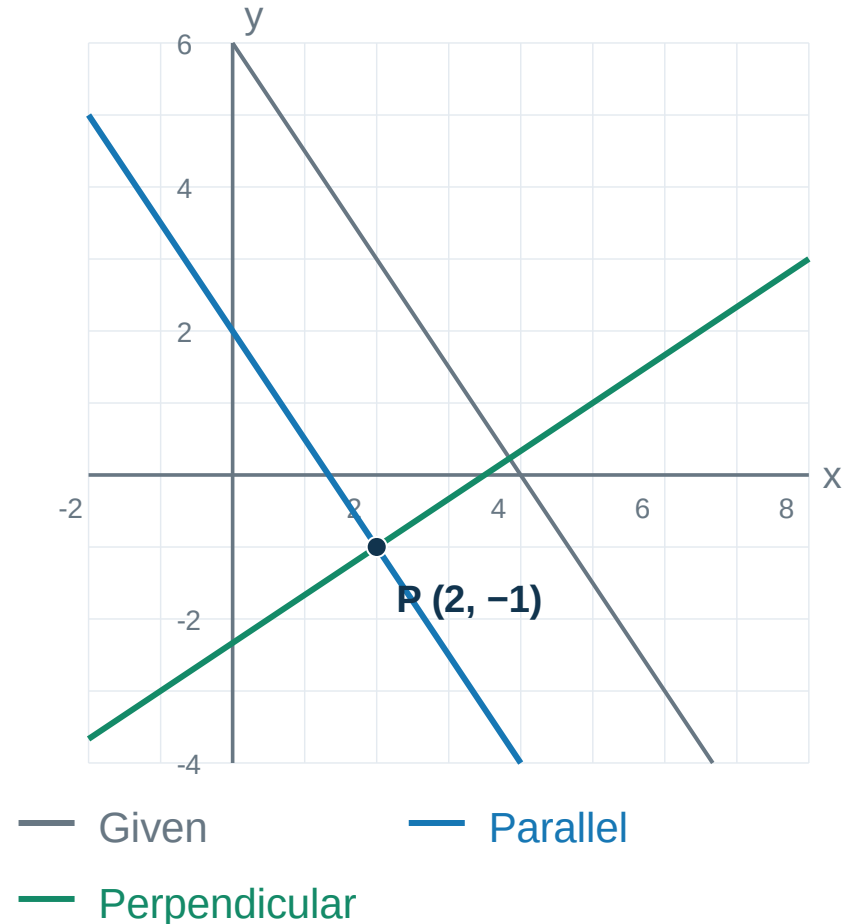
$$3x + 2y = 12$$

$$m = -\frac{3}{2}$$

2 Use the new point $(2, -1)$

$$\text{Parallel: } y + 1 = -\frac{3}{2}(x - 2)$$

$$\text{Perpendicular: } y + 1 = \frac{2}{3}(x - 2)$$



Practice: line equations

4 minutes. Write both equations and check the point.

Given line: $2x - 3y = 6$

New point: $P = (3, 4)$

A. A parallel line through P

B. A perpendicular line through P

Check both equations using $(3, 4)$.

Practice: solutions

The point check catches intercept errors

Parallel

$$m = 2/3$$

$$y - 4 = (2/3)(x - 3)$$

$$y = (2/3)x + 2$$

$$4 = (2/3)(3) + 2$$

Perpendicular

$$m = -3/2$$

$$y - 4 = (-3/2)(x - 3)$$

$$y = (-3/2)x + 17/2$$

$$4 = (-3/2)(3) + 17/2$$

A correct slope can still give the wrong line

Discuss the error before showing a correction

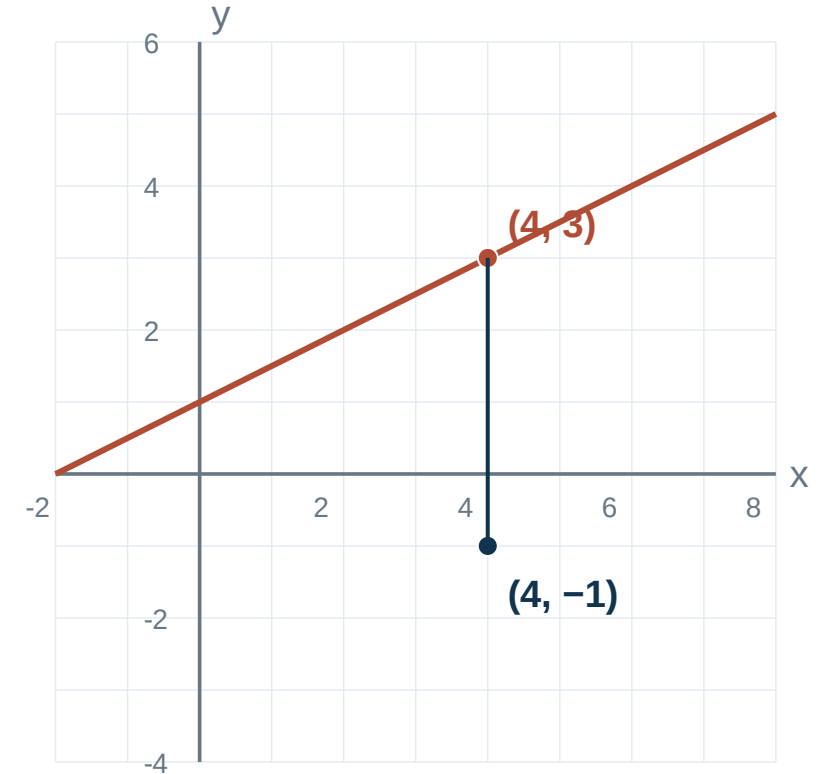
Given slope: -2

Required point: $(4, -1)$

Proposed: $y = \frac{1}{2}x + 1$

At $x = 4$: $y = \frac{1}{2}(4) + 1 = 3$

The slope works. The point does not.



Horizontal and vertical lines

A vertical line has undefined slope

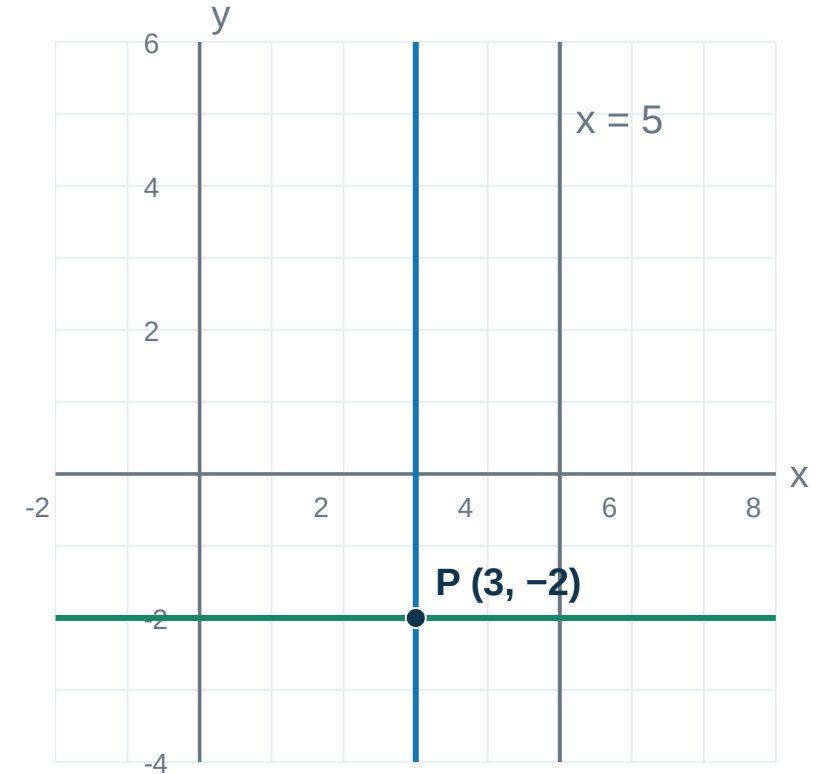
Through $P = (3, -2)$

Parallel to $x = 5$

$$x = 3$$

Perpendicular to $x = 5$

$$y = -2$$



Line equations: notes to keep

Part 1 summary

Given two points: $m = (y_2 - y_1)/(x_2 - x_1)$.

Parallel: keep the slope. Perpendicular: use $-1/m$.

Through (x_1, y_1) : $y - y_1 = m(x - x_1)$.

Check the required slope AND substitute the given point.

Horizontal: $y = \text{constant}$. Vertical: $x = \text{constant}$.

Circle equations: a notes guide

Part 2: organize the information before calculating

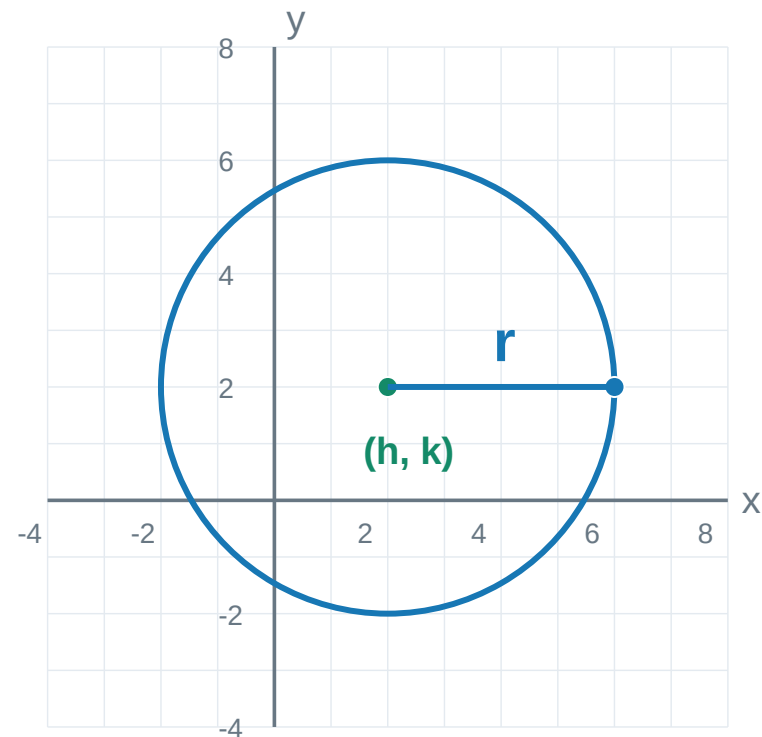
$$(x - h)^2 + (y - k)^2 = r^2$$

(h, k) locates the center.

r is the center-to-circle distance.

The equation uses the square of that distance.

Diameter endpoints? Find their midpoint first.



A circle from diameter endpoints

$A = (-2, 1)$ and $B = (6, 7)$

- 1 Midpoint gives the center

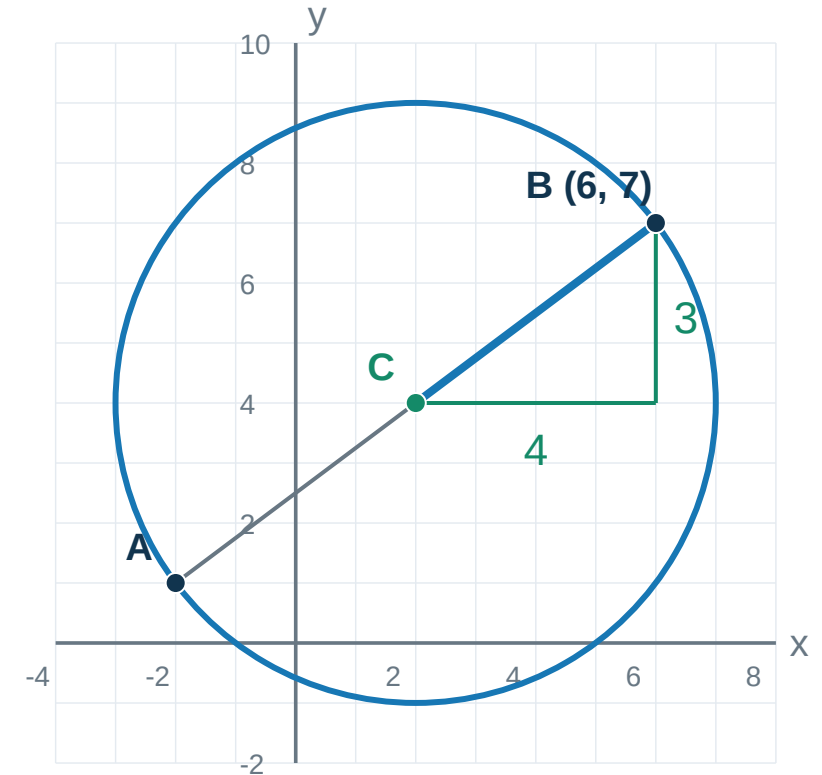
$$C = (2, 4)$$

- 2 From C to B: run 4, rise 3

$$r^2 = 4^2 + 3^2 = 25$$

- 3 Substitute the center and r^2

$$(x - 2)^2 + (y - 4)^2 = 25$$



Radius 5; diameter 10

Practice: circle equations

3 minutes. Identify the center and r^2 before writing the equation.

A. Center $(-1, 2)$, through the point $(2, 6)$.

B. Diameter endpoints $(-1, -3)$ and $(5, 5)$.

For each circle: write its equation and state the radius.

Practice: circle solutions

The right side of the equation is r^2

$$\text{A. } r^2 = (2 + 1)^2 + (6 - 2)^2 = 25$$

$$(x + 1)^2 + (y - 2)^2 = 25, \quad r = 5$$

$$\text{B. Center} = ((-1 + 5)/2, (-3 + 5)/2) = (2, 1)$$

$$(x - 2)^2 + (y - 1)^2 = 25, \quad r = 5$$

Mixed review: choosing a method

Part 3: use the question to choose your first step

Solve a quadratic equation: write zero on one side, then factor.

If factoring is unhelpful: complete the square or use the formula.

Add rational expressions: identify restrictions and find the LCD.

Find an x-intercept: set $y = 0$. Find a y-intercept: set $x = 0$.

After solving: check restrictions and the requested answer form.

Cumulative Test 1 practice

4 minutes. Show work before comparing answers.

1 Solve: $2x^2 - 5x - 3 = 0$

2 Simplify: $\frac{2}{x-1} + \frac{3}{x+1}$ State the original restrictions.

3 Find both intercepts: $3x + 2y = 12$

Cumulative practice: solutions

Earlier quadratic equation solving remains in the review

$$1. \quad (2x + 1)(x - 3) = 0 \qquad x = -\frac{1}{2} \text{ or } x = 3$$

$$2. \quad \frac{2(x + 1) + 3(x - 1)}{(x - 1)(x + 1)} = \frac{5x - 1}{(x - 1)(x + 1)}$$

Restrictions: $x \neq 1$ and $x \neq -1$

$$3. \quad \text{x-intercept: } (4, 0) \quad \text{y-intercept: } (0, 6)$$

My review notes

Complete these prompts before the exit ticket

My first step for a line equation

What I need for a circle equation

An error I corrected today

My next practice priority

Exit ticket

3 minutes. Write an equation and one check for each.

1. Perpendicular to $2x + y = 7$, through $(-2, 3)$.
2. Circle with diameter endpoints $(0, -2)$ and $(4, 4)$.

Which step still needs practice?

Preparation for Monday

Your next steps in ALEKS and test review

Practice a parallel and a perpendicular line through a point.

Practice a circle from the endpoints of a diameter.

Monday: receive Quiz 4, a take-home Test 1 review.

Wednesday: Test 1 at 2:10 PM. Quiz 4 due at 3:15 PM.

ALEKS 2.5/3.1 is due Wednesday at 2:10 PM.