6.8 Unit 6 Pretest Review – Lines and Planes

This document was composed and formatted by Annie Bernatchez.

The course material originated from www.jensenmath.ca

This review covers all of Unit 6: Lines and Planes, and is meant to be used to prepare for the unit test.

Section 1: 6.1 – Vector Equation of a Line in Two-Space

1) Write a vector equation for the line given its direction vector $\vec{m} = [3,\ 1]$ and point on the line $P(2,\ 7)$.

Section 2: 6.1 – Vector Equation Through Two Points

2) Write the vector equation of the line through each pair of points.

a) $A(1,\ 7)$ and $B(4,\ 10)$	b) $A(-3,\ 5)$ and $B(-2,\ -8)$

Section 3: 6.1 – Point on a Line

3) Determine if the point $P(-1,\ 11)$ is on the line $[x,\ y] = [3,\ 1] + t[-2,\ 5]$

Section 4: 6.1 – Parametric Equations of a Line

4) Write the parametric equation of each vector equation

a) $[x,\ y] = [10,\ 6] + t[13,\ 1]$	b) $[x,\ y,\ z] = [3,\ 0,\ -1] + t[6,\ -9,\ 1]$

Section 5: 6.2 – Vector Equation from Parametric Equations

5) Write the vector equation of each parametric equation

a) $\ell : \begin{cases} x = 1 + 4t \\ y = -6 + t \\ z = 2 - 2t \end{cases}$	b) $\ell : \begin{cases} x = 7 \\ y = -t \\ z = 0 \end{cases}$

Copyright © 2026 Annie Bernatchez—All rights reserved.

Section 6: 6.2 – Line Through Two Points in Three-Space

6) Given the points $A(3,\ 4,\ -5)$ and $B(9,\ -2,\ 7)$, write a vector equation and the parametric equations of the line through A and B.

Section 7: 6.1 – Parallel Lines

7) Determine if $\ell_1 : \begin{cases} x = 3 - 2t \\ y = 4 + t \end{cases}$ and $\ell_2 : 2x + 4y - 7 = 0$ are parallel, perpendicular, or neither. Explain.

Section 8: 6.2 – Vector Equations of Lines (Special Conditions)

8) Determine a vector equation of each line.

a) perpendicular to line $4x - 3y = 17$ and through point $P(-2,\ 4)$

b) parallel to the z-axis and through point $P(1,\ 5,\ 10)$

c) parallel to $[x,\ y,\ z] = [3,\ 3,\ 0] + t[3,\ -5,\ -9]$ with an x-intercept of -10

d) with the same x-intercept as $[x,\ y,\ z] = [3,\ 0,\ 0] + t[4,\ -4,\ 1]$ and the same z-intercept as $[x,\ y,\ z] = [6,\ -2,\ -3] + t[3,\ -1,\ -2]$

Section 9: 6.4 – Point on a Plane

9) Does the point $P(1,\ 2,\ 0)$ lie on the plane $4x + 3y - 5z = 10$?

Copyright © 2026 Annie Bernatchez—All rights reserved.

Section 10: 6.4 – Intercepts of a Plane

10) Find the x-, y-, and z-intercepts of each plane

a) $4x + 2y - 7z + 14 = 0$	b) $3x + 6z + 18 = 0$

Section 11: 6.3 – Parametric Equation of a Plane

11) Write the parametric equation of the plane $[x, y, z] = [0, -4, 1] + s[1, 10, -1] + t[0, 3, 4]$

Section 12: 6.3 – Vector Equation of a Plane

12) Write the vector equation of the plane $\pi : \begin{cases} x = 2 + s + 7t \\ y = 12s - 8t \\ z = 11 + 6s \end{cases}$

Section 13: 6.4 – Point on a Plane (Vector Form)

13) Determine if the point $P(-4, -13, 10)$ is on the plane $[x, y, z] = [6, -7, 10] + s[1, 3, -1] + t[2, -2, 1]$

Section 14: 6.4 – Intercepts of a Plane (Vector Form)

14) Determine the x-, y-, and z-intercepts of $[x, y, z] = [1, 8, 6] + s[1, -12, -12] + t[2, 4, -3]$

Section 15: 6.3 – Equation of a Plane from Points/Intercepts

15) Write a vector and parametric equation of each plane

a) contains the points $A(1, 3, -2)$, $B(3, -9, 7)$, and $C(4, -4, 5)$

Copyright © 2026 Annie Bernatchez—All rights reserved.

b) has x-int 8, y-int -3, and z-int 2

Section 16: 6.4 – Scalar Equation of a Plane

16) Determine an equation for each plane

a) parallel to the xz-plane; and through the point $A(3,\ 1,\ 5)$

b) containing the points $A(2,\ 1,\ 1)$, $B(5,\ -3,\ 2)$, and $C(0,\ -1,\ 4)$

Section 17: 6.4 – Scalar Equation from Normal and Point

17) Write the scalar equation of a plane given its normal $\vec{n} = [3,\ 7,\ 1]$ and a point $P(3,\ -6,\ 4)$ on the plane.

Section 18: 6.4 – Scalar Equation from Vector/Parametric Form

18) Write a scalar equation of each plane, given its vector or parametric equation.

a) $[x,\ y,\ z] = [3,\ 7,\ -5] + s[1,\ 2,\ -1] + t[1,\ -2,\ 3]$

b) $\pi : \begin{cases} x = 3 - 2s + 2t \\ y = 1 + 3s + t \\ z = 5 - s - 2t \end{cases}$

Section 19: 6.3 – Equations of a Plane (Special Conditions)

19) Write a vector and scalar equation of each plane

a) perpendicular to the line $[x,\ y,\ z] = [2,\ 4,\ -9] + t[3,\ 5,\ -3]$ and including the point $P(4,\ -2,\ 7)$

b) parallel to the yz-plane and including the point $P(-1,\ -2,\ 5)$

Copyright © 2026 Annie Bernatchez—All rights reserved.

c) parallel to the plane $3x - 9y + z - 12 = 0$ and including the point $P(-3, 7, 1)$

d) containing the lines $[x, y, z] = [-2, 3, 12] + s[-2, 1, 5]$ and $[x, y, z] = [1, -4, 4] + t[-6, 3, 15]$

Section 20: 6.7 – Angle Between Planes

20) Determine the angle between the planes $\pi_1 : 3x + 2y + 5z = 5$ and $\pi_2 : 4x - 3y - 2z = 2$

Section 21: 6.5 – Intersections of Lines

21) State the intersections of the following systems. Always try to predict the intersection before you spend time solving.

a) $\ell_1 : [x, y] = [-12, -7] + s[8, -5]$, $\ell_2 : [x, y] = [2, -1] + t[3, -2]$

b) $\ell_1 : [x, y, z] = [1, -1, 0] + s[2, -1, 3]$, $\ell_2 : [x, y, z] = [1, 2, 3] + t[3, 2, 4]$

c) $\ell_1 : [x, y, z] = [7, 2, -6] + s[2, 1, -3]$, $\ell_2 : [x, y, z] = [3, 9, 13] + t[1, 5, 5]$

Section 22: 6.6 – Intersection of a Line and a Plane

21 (continued)

d) $[x, y, z] = [3, 1, 2] + t[1, -4, -8]$, $\quad 4x + 2y - z - 8 = 0$

e) $\ell : \begin{cases} x = 2 + t \\ y = 2 + 2t \\ z = 9 + 8t \end{cases}$, $\quad \pi : 2x - 5y + z - 6 = 0$

Copyright © 2026 Annie Bernatchez—All rights reserved.

f) $\ell : [x, y, z] = [3, -2, 1] + t[14, -5, -3], \quad \pi : x + y + 3z - 4 = 0$

Section 23: 6.7 – Intersection of Planes

21 (continued)

g) $\pi_1 : x + 3y - 4z = 10, \quad \pi_2 : 3x + 9y - 12z = -30$

h) $\pi_1 : 5x - 4y + z = 3, \quad \pi_2 : x + 3y = 9$

i) $\pi_1 : x - 5y + 2z - 10 = 0, \pi_2 : x + 7y - 2z + 6 = 0, \pi_3 : 8x + 5y + z - 20 = 0$

j) $\pi_1 : 2x + y + 6z - 7 = 0, \pi_2 : 3x + 4y + 3z + 8 = 0, \pi_3 : x - 2y - 4z - 9 = 0$

k) $\pi_1 : x - y + 2z = 0, \pi_2 : x - y + 2z + 7 = 0, \pi_3 : z - 5 = 0$

l) $\pi_1 : x + 3y - z = -10, \pi_2 : 2x + y + z = 8, \pi_3 : x - 2y + 2z = -4$

Section 24: 6.6 – Distance from a Point to a Plane

22) Find the distance between the point $P(3, -2, 0)$ and the plane $4x - y + 8z = 2$.

Section 25: 6.5 – Distance Between Skew Lines

23) Find the distance between these skew lines.

$\ell_1 : [x, y, z] = [1, 0, -1] + s[2, 3, -4]$

$\ell_2 : [x, y, z] = [8, 1, 3] + t[4, -5, 1]$

Copyright © 2026 Annie Bernatchez—All rights reserved.

Answer Key

1. $[x, y] = [2, 7] + t[3, 1]$

2. a) $[x, y] = [1, 7] + t[1, 1]$ b) $[x, y] = [-3, 5] + t[1, -13]$

3. Yes

4. a) $\ell : \begin{cases} x = 10 + 13t \\ y = 6 + t \end{cases}$ b) $\ell : \begin{cases} x = 3 + 6t \\ y = -9t \\ z = -1 + t \end{cases}$

5. a) $[x, y, z] = [1, -6, 2] + t[4, 1, -2]$ b) $[x, y, z] = [7, 0, 0] + t[0, -1, 0]$

6. $[x, y, z] = [3, 4, -5] + t[1, -1, 2]$; $\ell : \begin{cases} x = 3 + t \\ y = 4 - t \\ z = -5 + 2t \end{cases}$

7. Parallel

8. a) $[x, y] = [-2, 4] + t[4, -3]$ b) $[x, y, z] = [1, 5, 10] + t[0, 0, 1]$ c) $[x, y, z] = [-10, 0, 0] + t[3, -5, -9]$ d) $[x, y, z] = [3, 0, 0] + t[3, 0, -1]$

9. Yes

10. a) x-int: $-\frac{7}{2}$; y-int: -7; z-int: 2 b) x-int: -6; y-int: none; z-int: -3

11. $\pi : \begin{cases} x = s \\ y = -4 + 10s + 3t \\ z = 1 - s + 4t \end{cases}$

12. $[x, y, z] = [2, 0, 11] + s[1, 12, 6] + t[7, -8, 0]$

13. No

14. x-int: 1; y-int: -4; z-int: 3

15. a) $[x, y, z] = [1, 3, -2] + s[2, -12, 9] + t[1, 5, -2]$; $\pi : \begin{cases} x = 1 + 2s + t \\ y = 3 - 12s - 7t \\ z = -2 + 9s + 7t \end{cases}$ b) $[x, y, z] = [8, 0, 0] + s[8, 3, 0] + t[4, 0, -1]$; $\pi : \begin{cases} x = 8 + 8s + 4t \\ y = 3s \\ z = -t \end{cases}$

16. a) $y = 1$ b) $[x, y, z] = [2, 1, 1] + s[3, -4, 1] + t[5, -2, -2]$

17. $3x + 7y + z + 29 = 0$

18. a) $x - y - z - 1 = 0$ b) $5x + 6y + 8z - 61 = 0$

19. a) $[x, y, z] = [4, -2, 7] + s[1, 0, 1] + t[0, 3, 5]$; $3x + 5y - 3z + 19 = 0$ b) $[x, y, z] = [-1, -2, 5] + s[0, 0, 1] + t[0, 1, 0]$; $x = -1$ or $x + 1 = 0$ c) $[x, y, z] = [-3, 7, 1] + s[3, 1, 0] + t[1, 0, -3]$; $3x - 9y + z + 71 = 0$ d) $[x, y, z] = [-2, 3, 12] + s[-2, 1, 5] + t[-3, 7, 8]$; $27x - y + 11z - 75 = 0$

20. 96.9°

21. a) $(356, -237)$ b) no intersection; skew lines c) $(1, -1, 3)$ d) $(2, 5, 10)$ e) no intersection; parallel and distinct f) infinite solutions; parallel and coincident g) no intersection; parallel and distinct h) $[x, y, z] = [9, 0, -42] + t[-3, 1, 19]$ i) $[x, y, z] = [2, 0, 4] + t[-1, 1, 3]$ j) $(3, -5, 1)$ k) inconsistent system; no solution l) inconsistent system; no solution

22. $\frac{4}{3}$

23. 6.79

Copyright © 2026 Annie Bernatchez—All rights reserved.