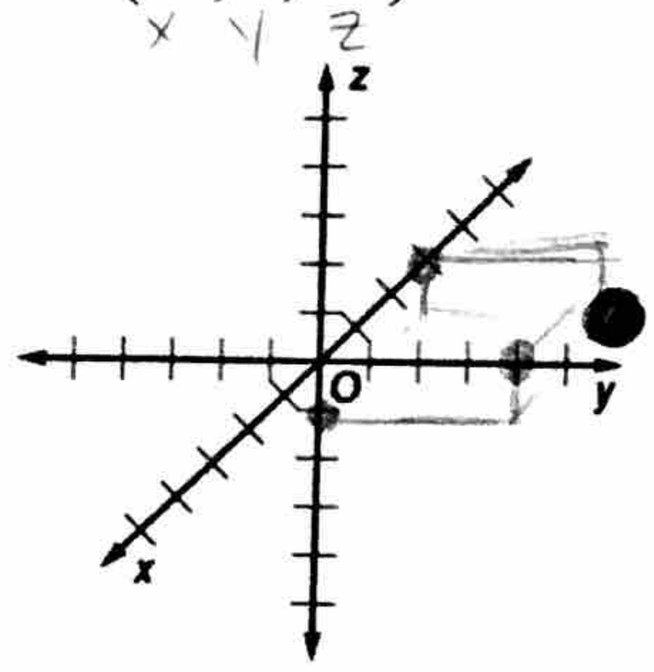
NAME Key DATE PERIOD

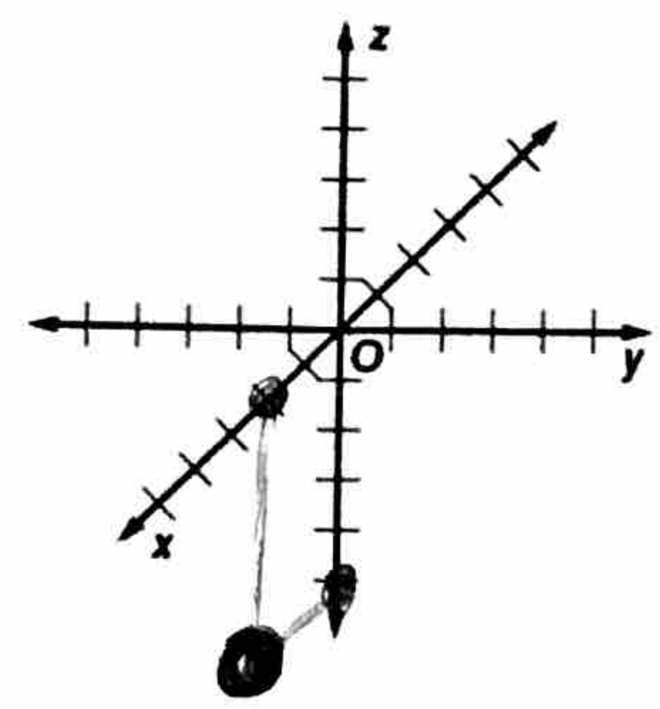
8-3 Practice *Vectors in Three-Dimensional Space*

Plot each point in a three-dimensional coordinate system.

1. (–3, 4, –1)

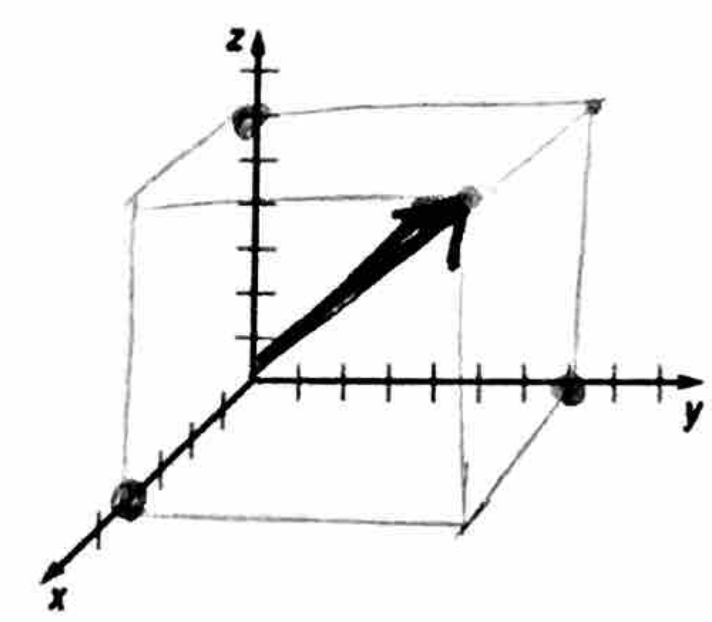


2. (2, 0, –5)

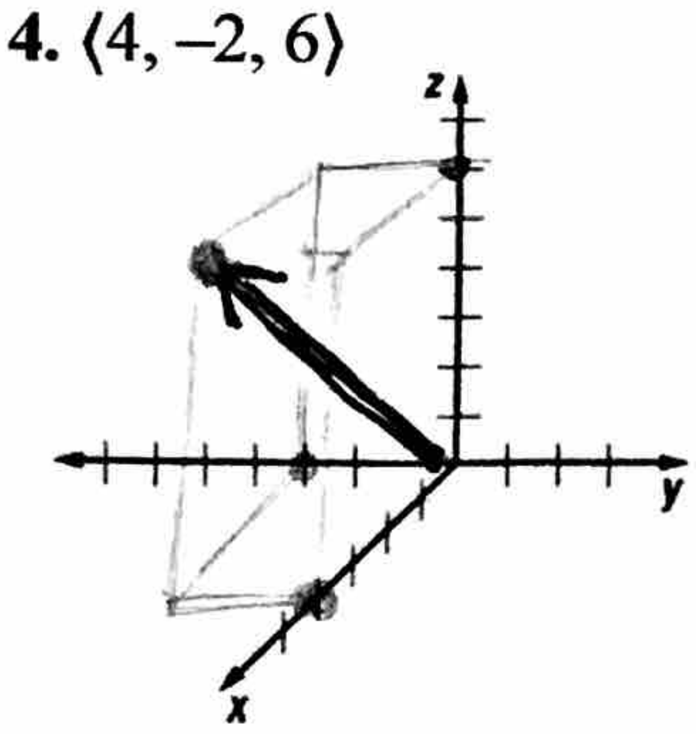


Locate and graph each vector in space.

3. ⟨4, 7, 6⟩



4. ⟨4, –2, 6⟩



Find the component form AND magnitude of $\overrightarrow{AB}$ with the given initial and terminal points.

5. $A(2, 1, 3)$, $B(-4, 5, 7)$

$\overrightarrow{AB} = \langle -4-2, 5-1, 7-3 \rangle$

$\boxed{\overrightarrow{AB} = \langle -6, 4, 4 \rangle}$

$|\overrightarrow{AB}| = \sqrt{(-6)^2+4^2+4^2}$

$= \sqrt{68} = \sqrt{4}\sqrt{17}$

$\boxed{|\overrightarrow{AB}| = 2\sqrt{17}}$

6. $A(4, 0, 6)$, $B(7, 1, -3)$

$\overrightarrow{AB} = \langle 7-4, 1-0, -3-6 \rangle$

$\boxed{\overrightarrow{AB} = \langle 3, 1, -9 \rangle}$

$|\overrightarrow{AB}| = \sqrt{3^2+1^2+(-9)^2}$

$= \sqrt{91}$

$\boxed{|\overrightarrow{AB}| = \sqrt{91}}$

7. $A(-4, 5, 8)$, $B(7, 2, -9)$

$\overrightarrow{AB} = \langle 7-(-4), 2-5, -9-8 \rangle$

$\boxed{\overrightarrow{AB} = \langle 11, -3, -17 \rangle}$

$|\overrightarrow{AB}| = \sqrt{11^2+(-3)^2+(-17)^2}$

$= \sqrt{419}$

$\boxed{|\overrightarrow{AB}| = \sqrt{419}}$

8. $A(6, 8, -5)$, $B(7, -3, 12)$

$\overrightarrow{AB} = \langle 7-6, -3-8, 12-(-5) \rangle$

$\boxed{\overrightarrow{AB} = \langle 1, -11, 17 \rangle}$

$|\overrightarrow{AB}| = \sqrt{1^2+(-11)^2+17^2}$

$= \sqrt{411}$

$\boxed{|\overrightarrow{AB}| = \sqrt{411}}$

Find the magnitude of the vector with the given endpoints.

9. (3, 4, –9), (–4, 7, 1)

$\sqrt{(-4-3)^2+(7-4)^2+(1-(-9))^2}$

$= \sqrt{(-7)^2+3^2+10^2}$

$= \boxed{\sqrt{158}}$

10. (–17, –3, 2), (3, –9, 5)

$\sqrt{(3-(-17))^2+(-9-(-3))^2+(5-2)^2}$

$= \sqrt{20^2+(-6)^2+3^2}$

$\boxed{= \sqrt{445}}$

Find each of the following for v = ⟨2, –4, 5⟩ and w = ⟨6, –8, 9⟩.

11. 8v + w

$\langle 16, -32, 40 \rangle + \langle 6, -8, 9 \rangle$

$\boxed{\langle 22, -40, 49 \rangle}$

12. 5v – 2w

$\langle 10, -20, 25 \rangle - \langle 12, -16, 18 \rangle$

$\boxed{\langle -2, -4, 7 \rangle}$

Write $\overline{LB}$ as a sum of unit vectors.

13. ***L*(12, 2, 6), *B*(-8, 7, -5)**

$\overrightarrow{LB} = \langle -8-12, 7-2, -5-6 \rangle$

$\overrightarrow{LB} = \langle -20, 5, -11 \rangle$

$\boxed{\overrightarrow{LB} = -20\vec{i}+5\vec{j}-11\vec{k}}$

14. ***L*(-9, 12, -5), *B*(6, 5, -5)**

$\overrightarrow{LB} = \langle 6-(-9), 5-12, -5-(-5) \rangle$

$\overrightarrow{LB} = \langle 15, -7, 0 \rangle$

$\boxed{\overrightarrow{LB} = 15\vec{i}-7\vec{j}}$

15. PHYSICS Suppose that the force acting on an object can be expressed by the vector ⟨85, 35, 110⟩, where each measure in the ordered triple represents the force in pounds. What is the magnitude of this force?

$\sqrt{85^2+35^2+110^2}$

$= \sqrt{20550} \approx \boxed{143 \text{ lb}}$

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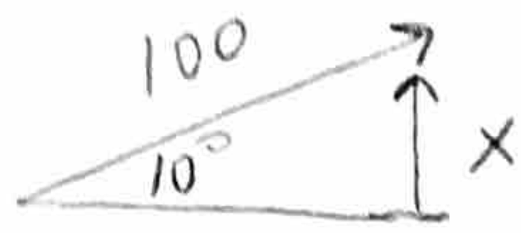
8-5 Vector Applications

For each question below, *you must show all of your work*, and drawing a picture will be extremely helpful!

16. What would be the force required to push a 100lb object along a ramp that is inclined 10° with the horizontal? (Assume friction is not a factor).

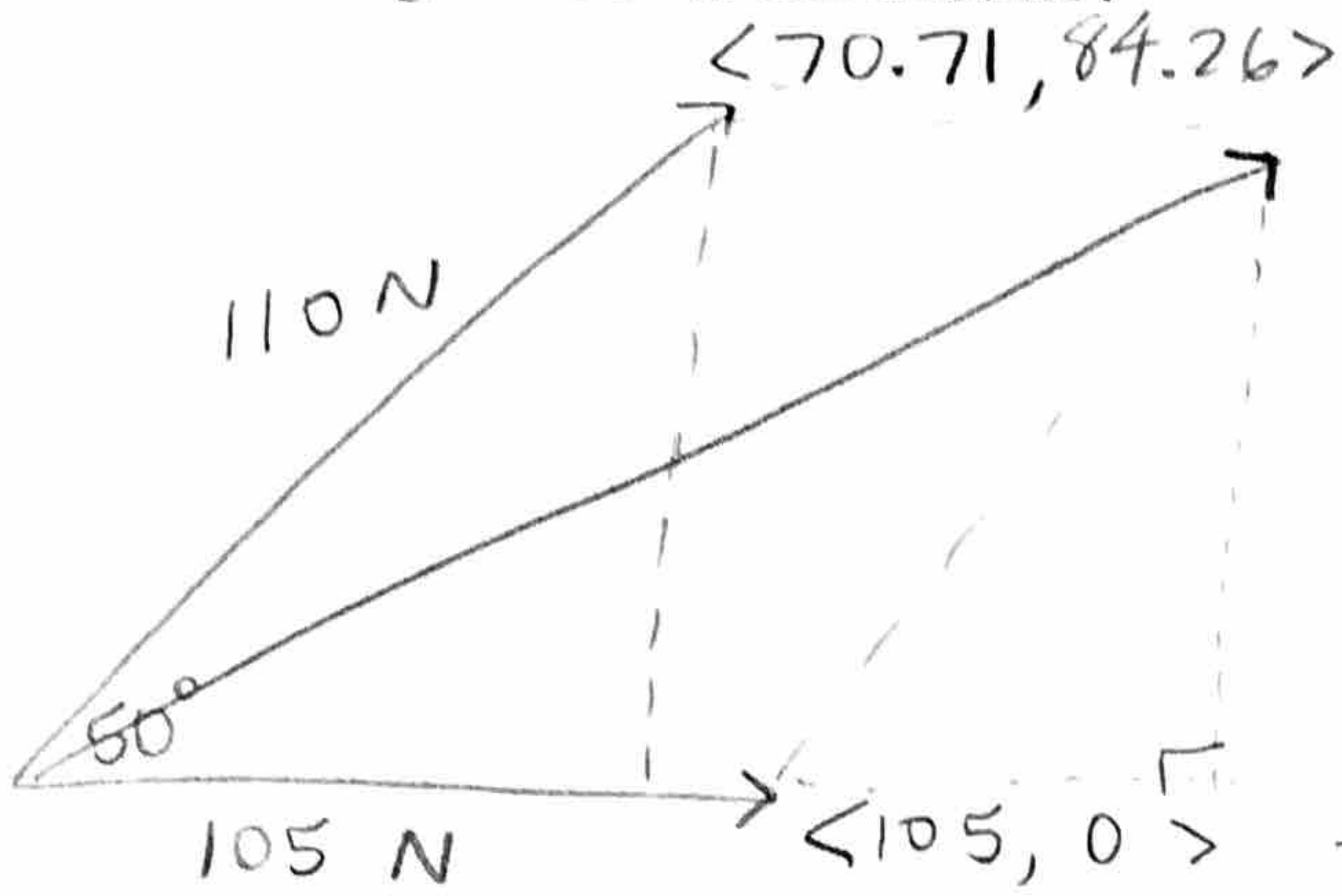


$\sin 10 = \frac{x}{100}$

$x = 100 \cdot \sin 10$

$\boxed{x \approx 17.36 \text{ lb}}$

17. What is the magnitude and direction of the resultant of a 105-newton force along the *x*-axis and a 110-newton force at an angle of 50° to one another?



$\cos 50 = \frac{x}{110}$

$110 \cos 50 = x$

$x \approx 70.71$

$\sin 50 = \frac{y}{110}$

$110 \sin 50 = y$

$y \approx 84.26$

resultant $= \langle 70.71, 84.26\rangle + \langle 105, 0\rangle$

$\langle 175.71, 84.26\rangle$

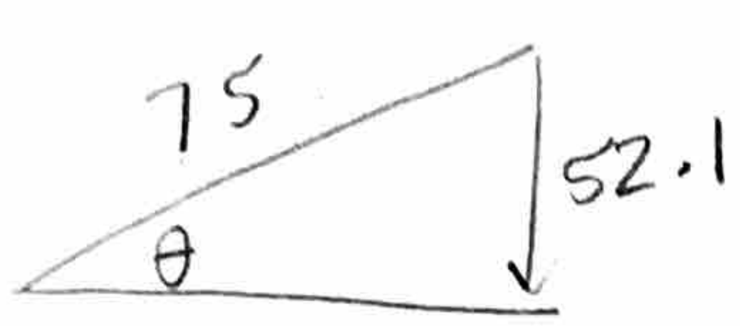
$\tan\theta = \frac{84.26}{175.71}$

$\boxed{\theta \approx 25.62°}$

$\sqrt{175.71^2 + 84.26^2}$

$\approx \boxed{194.87 N}$

18. To keep a 75-pound block from sliding down an incline, a 52.1-pound force is exerted on the block along the incline. Find the angle that the incline makes with the horizontal.



$\sin\theta = \frac{52.1}{75}$

$\theta = \sin^{-1}\left(\frac{52.1}{75}\right)$

$\boxed{\theta \approx 44°}$

19. Find the magnitude and direction of the resultant of two forces of 250lbs and 45lbs at angles of 25° and 250° with the *x*-axis respectively.

$\cos 25 = \frac{f_x}{250}$

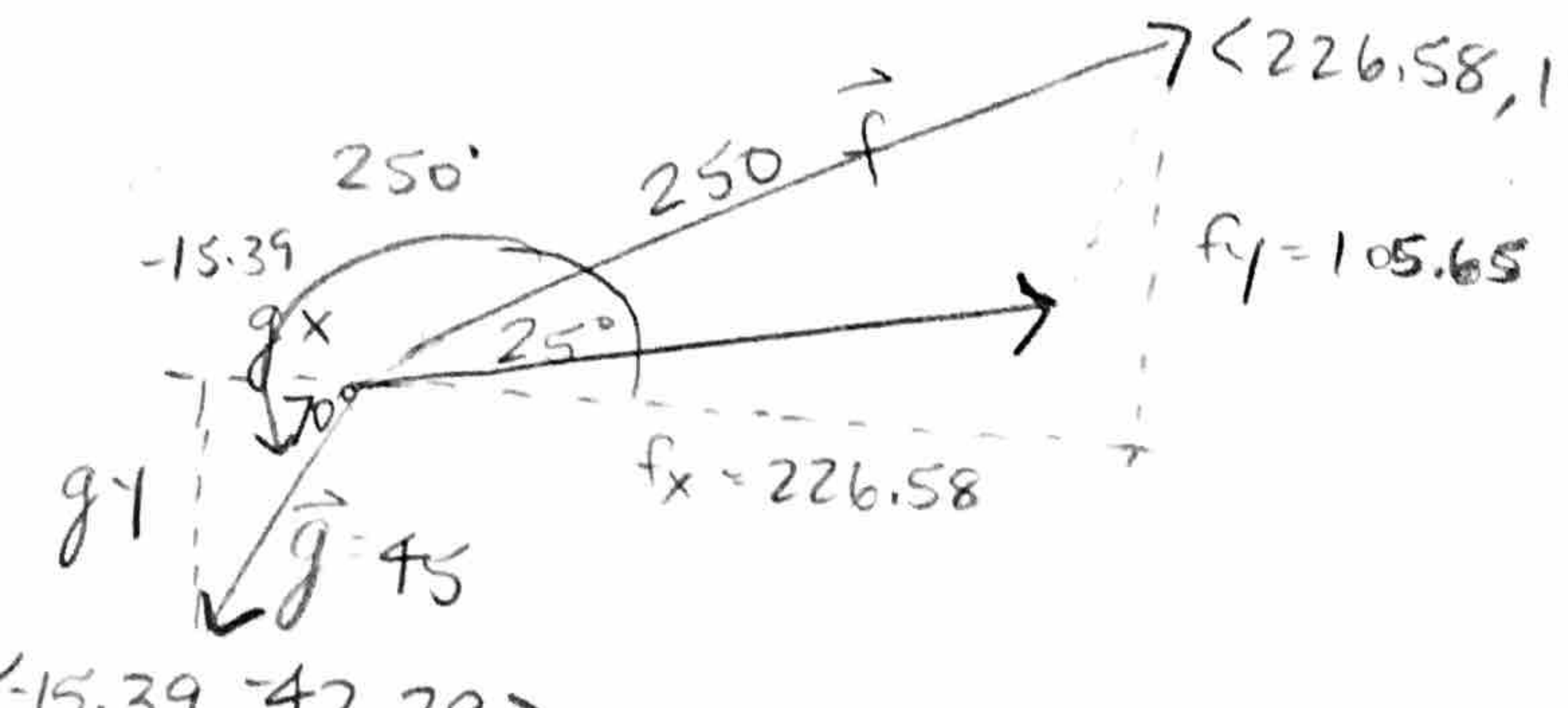
$250 \cdot \cos 25 = f_x$

$f_x = 226.58$

$\sin 25 = \frac{f_y}{250}$

$250 \cdot \sin 25 = f_y$

$f_y = 105.65$



resultant $= \langle 226.58, 105.65\rangle + \langle -15.39, -42.29\rangle$

$= \langle 211.19, 63.36\rangle$

$\sqrt{211.19^2 + 63.36^2}$

$\boxed{\approx 220.49 \text{ lb}}$

$\tan\theta = \frac{63.36}{211.19}$

$\boxed{\theta \approx 16.7°}$

$\cos 70 = \frac{-gx}{45}$

$45 \cos 70 = -gx$

$gx \approx -15.39$

$\sin 70 = \frac{-gy}{45}$

$45 \sin 70 = -gy$

$gy \approx 42.29$