

$$1. \quad \pm \frac{1}{2} \begin{vmatrix} 7 & -6 & 1 \\ -2 & -3 & 1 \\ -3 & 9 & 1 \end{vmatrix} = 52.5$$

$$2. \quad \begin{bmatrix} -1 & 2 & -5 & 0 \\ 5 & 0 & -1 & 6 \\ 0 & 2 & 7 & -4 \\ -3 & -8 & 2 & 0 \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 14 \\ 8 \\ -5 \\ -9 \end{bmatrix}$$

$$\begin{bmatrix} \\ \\ \\ \end{bmatrix}^{-1} \cdot \begin{bmatrix} \\ \\ \\ \end{bmatrix} = \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix}$$

$$w = -215 \quad x = 102 \quad y = 81 \quad z = 194$$

$$3. \quad p + n + d = 22$$

$$.01p + .05n + .1d = 1.40$$

$$n = d - 3 \rightarrow n - d = -3$$

$$\begin{bmatrix} 1 & 1 & 1 \\ .01 & .05 & .1 \\ 0 & 1 & -1 \end{bmatrix} \begin{bmatrix} p \\ n \\ d \end{bmatrix} = \begin{bmatrix} 22 \\ 1.40 \\ -3 \end{bmatrix}$$

↑
coefficient matrix.

4. Multiply diagonals going down - Multiply diagonals going up.

$$5. \quad \frac{1}{\det \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}} \text{ For matrix } \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$$6. \quad 2 \times 3 \cdot 3 \times 3 = 2 \times 3 \quad \begin{bmatrix} 7 & 12 & -5 \\ -9 & 20 & 45 \end{bmatrix}$$

7. $(x-6)^2 + (y+5)^2 = 49$ 8. $p = -5$ down directrix: $y = 1$
 vertex: $(3, -4)$ focus: $(3, -9)$

9. $c^2 = a^2 - b^2$ center: $(1, -8)$
 $c^2 = 64 - 49$
 $c^2 = 15$
 $c = \sqrt{15}$ Foci: $(1, -8 \pm \sqrt{15})$

10. $4y^2 + 40y + 25 - 3x^2 + 6x - 85 + 100 - 3 = 0$
 $4(y^2 + 10y + 25) - 3(x^2 - 2x + 1) = 12$ Hyperbola

$$\frac{4(y+5)^2}{12} - \frac{3(x-1)^2}{3} = 1 \Rightarrow \frac{(y+5)^2}{3} - \frac{(x-1)^2}{4} = 1$$

11. $y^2 - 12y + 36 = -4x - 72 + 36$

$$(y-6)^2 = -4x - 36 \text{ or } (y-6)^2 = -4(x+9) \text{ Parabola}$$


12. $15(x^2 + 4x + 4) + 2(y^2 - 8y + 16) = -62 + 60 + 32$

$$\frac{15(x+2)^2}{30} + \frac{2(y-4)^2}{15} = 1 \Rightarrow \frac{(x+2)^2}{2} + \frac{(y-4)^2}{15} = 1 \text{ Ellipse}$$

13. $x^2 + 2x + 1 + y^2 - 2y + 1 = 7 + 1 + 1$

$$(x+1)^2 + (y-1)^2 = 9$$

center $(-1, 1)$ $r = 3$

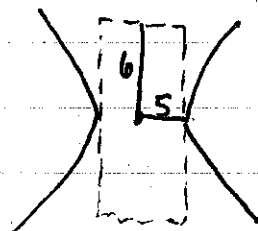
14.  Vertices: $(10, -2)$ $(10, -22)$
 Co-vert: $(2, -12)$ $(18, -12)$

15. $m = \pm \frac{6}{5} \quad (y+3) = \pm \frac{6}{5}(x+2)$

$y = -\frac{6}{5}x - \frac{12}{5} - 3 \quad y = \frac{6}{5}x + \frac{12}{5} - 3$

$y = -\frac{6}{5}x - \frac{27}{5}$

$y = \frac{6}{5}x - \frac{3}{5}$



16. $144 = 225 - b^2$
 $-81 = -b^2$
 $81 = b^2$

$\frac{x^2}{225} + \frac{y^2}{81} = 1$

17. $\|\vec{v}\| = \sqrt{4+25} = \sqrt{29}$

18. $\tan \theta = \left(-\frac{4}{3}\right)$

$\theta = \tan^{-1}\left(-\frac{4}{3}\right)$

$\theta = -53.13^\circ$ Q IV

+ 360°

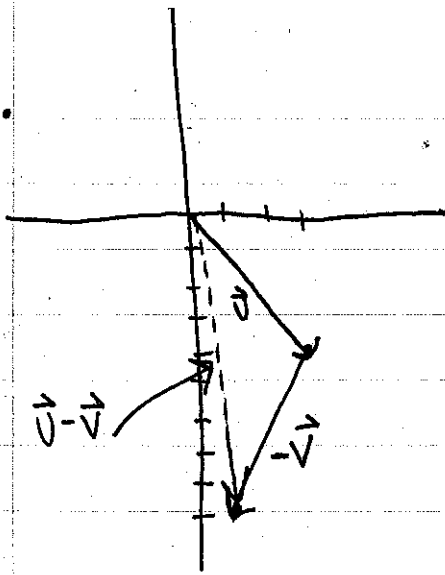
306.87°

19. $\left\langle \frac{2}{\sqrt{29}}, \frac{5}{\sqrt{29}} \right\rangle = \left\langle \frac{2\sqrt{29}}{29}, \frac{5\sqrt{29}}{29} \right\rangle$

20. $\vec{u} + \vec{v} = \langle 5, 1 \rangle$

$\|\quad\| = \sqrt{25+1} = \sqrt{26}$

21.

 $\angle 1, -97^\circ$ 

$$22. \frac{-14}{\sqrt{25} \cdot \sqrt{29}} = \cos \theta \Rightarrow \theta = \cos^{-1} \left(\frac{-14}{5\sqrt{29}} \right)$$

$$= 121.33^\circ$$

$$23. \left(r, \theta \right) \tan^{-1} \left(\frac{-8}{-5} \right) = 57.99^\circ + 180^\circ$$

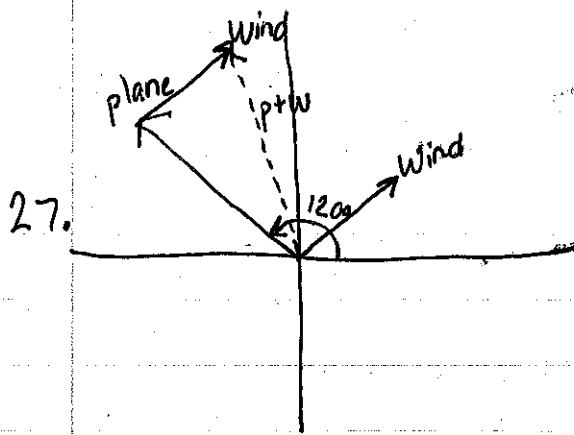
$$\left(\underset{\substack{\downarrow \\ \sqrt{89}}}{9.43}, 238^\circ \right)$$

$$24. (r \cos \theta, r \sin \theta) = (6 \cos 115^\circ, 6 \sin 115^\circ) = (-2.54, 5.43)$$

$$25. \sqrt{9+64} = \sqrt{73} \quad \tan^{-1} \left(\frac{-8}{3} \right) = -69.44^\circ + 360^\circ = 290.56^\circ$$

$$\sqrt{73} (\cos 290.56^\circ - i \sin 290.56^\circ)$$

$$26. 9.95 + 6.71i$$



$$V_p = \langle 530 \cos 120^\circ, 530 \sin 120^\circ \rangle$$

$$V_w = \langle 18 \cos 45^\circ, 18 \sin 45^\circ \rangle$$

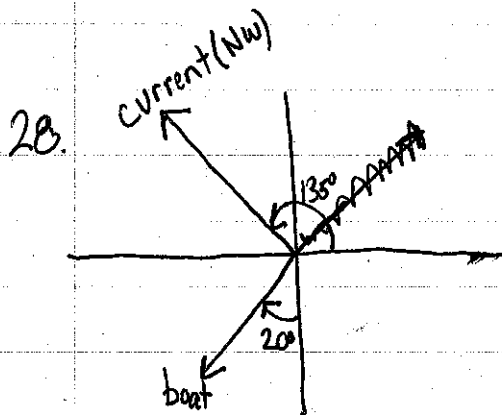
$$V_p + V_w = \langle -252.27, 471.72 \rangle$$

$$\text{Speed: } \|V_p + V_w\| = \sqrt{(-252.27)^2 + (471.72)^2} = \boxed{534.94 \text{ mph}}$$

$$\text{direction: } \tan^{-1}\left(\frac{471.72}{-252.27}\right) = -61.86^\circ \text{ QIV}$$

$$+ 180^\circ \rightarrow \text{QII}$$

$$\boxed{118.14^\circ}$$



~~$$V_b + V_c = \langle 9 \cos 250^\circ, 9 \sin 250^\circ \rangle$$~~

$$= \langle -3.08, -8.46 \rangle$$

$$V_c = \langle 6 \cos 135^\circ, 6 \sin 135^\circ \rangle$$

$$= \langle -4.24, 4.24 \rangle$$

$$V_b = \langle -3.08, -8.46 \rangle - \langle -4.24, 4.24 \rangle$$

$$= \langle 1.16, -12.7 \rangle$$

$$\text{Speed} = \sqrt{1.16^2 + (-12.7)^2}$$

$$= \boxed{12.75 \text{ knots}}$$

$$\text{direction} = \tan^{-1}\left(\frac{-12.7}{1.16}\right) = -84.78^\circ + 360^\circ = 275.22^\circ$$

$$\text{bearing: } 450^\circ - 275.22^\circ = \boxed{174.78^\circ} \text{ same as } E 84.78^\circ S$$

$$\text{or } S 5.22^\circ E$$