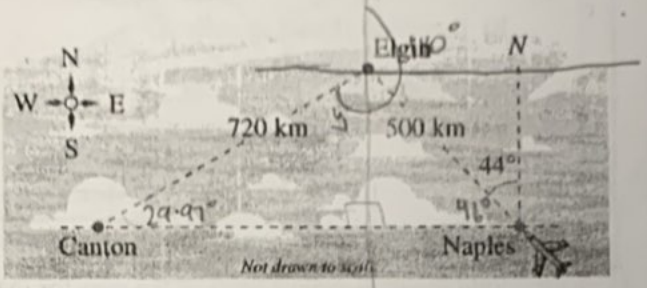
Hon Pre-Calc
Test Chapter 6 Name [redacted]

75/80

Only Scientific Calculators Allowed!! Show All Work!! Circle All Final Answers!!

Short Answer

1. A plane flies 500 kilometers with a bearing of 316° from Naples to Elgin (see figure). The plane then flies 720 kilometers from Elgin to Canton (Canton is due west of Naples). Find the bearing of the flight from Elgin to Canton.



$\frac{\sin 44}{700} = \frac{\sin Y}{500}$

$x = 29.97°$

$y = (90 + 29.96)$

$y = 60.03°$

Bearing $= 60.03° + 180°$

Bearing = 240.03°

Polar Form

Division $\Rightarrow \frac{[r_1, \theta_1]}{[r_2, \theta_2]} \Rightarrow \left[\frac{r_1}{r_2}, \theta_1 - \theta_2\right]$

Multiplacation $\Rightarrow [r_1, \theta_1][r_2, \theta_2] \Rightarrow [r_1 \cdot r_2, \theta_1 + \theta_2]$

2. Find the area of the triangle having the indicated angle and sides.

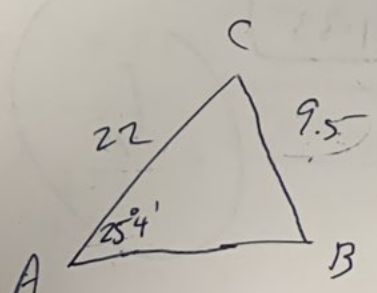
$A = 5°15', \ b = 4.5, \ c = 22$

5.25°

$A = \frac{1}{2} bc \sin A$

$A = \frac{1}{2} * 4.5 * 22 * \sin 5.25°$

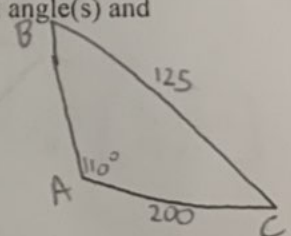
A = 4.53



3. Solve the triangles with the given angle(s) and side(s).

a) $A = 110°, a = 125, b = 200$

Not a Possible Triangle



b) $A = 25°4', a = 9.5, b = 22$

Two Triangles

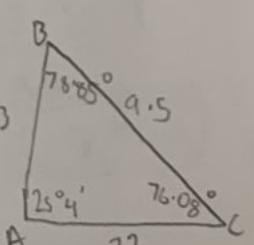
$\frac{\sin B}{22} = \frac{\sin 25°4'}{9.5}$

B = 78.85°

C = 76.08°

OR

B ≈ 101.15°, C ≈ 53.78°, c ≈ 18.09

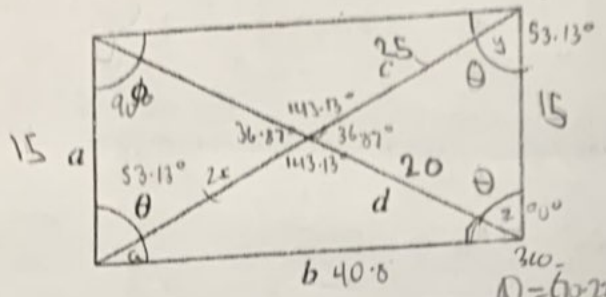


21.23

$\frac{c}{\sin 76.08} = \frac{9.5}{\sin 25°4'}$

c = 21.23

4. Given $a = 15$, $c = 25$, and $d = 20$, Find the values of b, θ, and ϕ. (The figure below is a parallelogram. Please show work)



$\phi = 70.23°$

$20^2 = 25^2 + 15^2 - 2(15)(25)\cos y$

$y = 53.13°$

$\frac{\sin 143.13}{40.8} = \frac{\sin a}{20}$

$25^2 = 20^2 + 15^2 - 2(20)(15)\cos z$

$a = 17.1$

$z = 90$

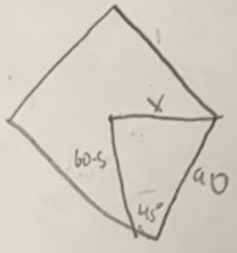
$\theta = 70.23°$

$b^2 = 15^2 + 20^2 - 2(20)(25)\cos 143.13°$

$b = 40.8$

$\phi = 109.77°$

5. A baseball diamond is a square with 90 foot sides. The pitcher's mound is 60.5 feet from home plate. How far is the pitcher's mound from 1st base?



$x^2 = 60.5^2 + 90^2 - 2(60.5)(90)\cos 45°$

$x = 63.72$ feet

6. Given a vector with initial point (9,3) and termin. point (1,11), find:

Vector = $\langle 1-9, 11-3 \rangle$

$= \langle -8, 8 \rangle$

a) Magnitude (exactly) = $\sqrt{64+64}$

$= \sqrt{128}$

$= \sqrt{64 \cdot 2}$

$= 8\sqrt{2}$

b) Direction (Exact in radians)

$\tan^{-1}\left(\frac{8}{-8}\right) = \tan^{-1}(-1)$

$= \frac{3\pi}{4}, \frac{5\pi}{4}$

7. Find the **component** form of the sum for the following two vectors in polar form.

$\vec{u} = [50, 30°]$, and $\vec{v} = [30, 110°]$

$\vec{u} = \langle 50\cos 30, 50\sin 30 \rangle$ $\vec{v} = \langle 30\cos 110, 30\sin 110 \rangle$

$\vec{u} + \vec{v} = \langle 33.04, 53.19 \rangle$

8. Three forces with magnitudes of 75 pounds, 100 pounds, and 125 pounds act on an object at angles of 30°, 45°, and 120°, respectively, with the positive x-axis. Find the direction and magnitude of the resultant of these three forces.

a) Magnitude = 228.49

$X = 75\cos 30 + 100\cos 45 + 125\cos 120$

$= 73.1625834$

$y = 75\sin 30 + 100\sin 45 + 125\sin 120$

$= 216.463536$

b) Direction = 71.33°

$\tan^{-1}\left(\frac{x}{y}\right)$

-6

9. Use the vectors $\vec{u} = \langle 3,3 \rangle$, $\vec{v} = \langle -4,2 \rangle$, and $\vec{w} = \langle 3,-1 \rangle$ to find the indicated quantity.

$(3\vec{w} \cdot \vec{v})\vec{u}$ ← Dot Product

$= (\langle 9,-3 \rangle \cdot \langle -4,2 \rangle)\vec{u}$

$= (-42)\langle 3,3 \rangle$ $\quad \langle -126, -126 \rangle$

$= \langle -108, -18 \rangle$

10. Find the angle (in degrees) between the vectors.

$\vec{u} = 3\mathbf{i} - 5\mathbf{j}$ $\quad \langle 3,-5 \rangle$

$\vec{v} = \mathbf{i} + 2\mathbf{j}$ $\quad \langle 1,2 \rangle$

$\theta = 59.036°$

$+$

$\theta = 63.43° = 122.47°$

11. Determine whether $\vec{u}$ and $\vec{v}$ are parallel, orthogonal, or neither.

a) $\vec{u} = \langle -12, 30 \rangle$ $\quad$ slope $\vec{u} = \frac{30}{-12} = -\frac{5}{2}$

$\vec{v} = \left\langle \frac{1}{2}, -\frac{5}{4} \right\rangle$ $\quad$ slope $\vec{v} = \frac{-5/4}{1/2} = -\frac{5}{2}$

Parallel

b) $\vec{u} = 2\mathbf{i} - 2\mathbf{j}$

$\vec{v} = -\mathbf{i} - \mathbf{j}$

Orthogonal

$\vec{u} \cdot \vec{v} = -2 + 2$

$= 0$

12. Find the **exact** terminal point of a vector with magnitude of 6, that has the same direction as $\langle -2, 2\sqrt{3} \rangle$, and has an initial point of (-3,2).

$(-3,2)$

$\tan^{-1}\left(\frac{2\sqrt{3}}{-2}\right) = 300°$

$\langle 6\cos 300, 6\sin 300 \rangle = \langle x-(-3), y-2 \rangle$

$y - 2 = \frac{6\sqrt{3}}{2}$ $\quad x+3 = 3$

$y = 2+3\sqrt{3}$ $\quad -3 \quad -3$

$x = -6$

$(-6, 2+3\sqrt{3})$

13. Find the complex form of the following number:

$5(\cos 198°45' + i \sin 198°45')$

$-4.74 - 1.59i$

14. Perform the indicated operations. Leave answers in polar form.

Division $\quad \frac{r_1}{r_2}, \theta_1 - \theta_2$

a) $\frac{[5, 4.3]}{[4, 2.1]} = [5-4, 4.3-2.1]$

$= [1, 2.2]$ $\quad = \left[\frac{5}{4}, 2.2\right]$

b) $\left[\frac{3}{4}, \frac{\pi}{3}\right]\left[4, \frac{3\pi}{4}\right]$

$\left[\frac{3}{4}+4, \frac{\pi}{3}+\frac{3\pi}{4}\right]$

$\left[\frac{19}{4}, \frac{13\pi}{12}\right]$

$\left[3, \frac{13\pi}{12}\right]$

Multiplication

$r_1 \cdot r_2, \theta_1 + \theta_2$

-4

$\frac{r_1}{r_2}, \theta_1 - \theta_2$

15. Perform the indicated operation. Leave answer in **trig** form.

$\frac{1+\sqrt{3}i}{6-3i}$ mag = 2, $\theta = 60°$; mag = $3\sqrt{5}$, $\theta = 333.43494882°$

DIVISION $\Rightarrow [2, 60°]$ / $[3\sqrt{5}, 333.43494882°]$

$= [2 \cdot 3\sqrt{5}, 86.565°]$

$2 \cdot 3\sqrt{5}\,(\cos 86.565° + i \sin 85.565°)$

$2\sqrt{45}$

16. Write the indicated power in standard complex form.

$(1-\sqrt{3}i)^6$ mag = 2, $\theta = 300°$

$2[2, 300°]^6$

$[64, 1800°]$

$64\cos 1800° + i\,64 \sin 1800°$

$= 64 + 0i$

$= 64 + i$

$= \boxed{64}$

3

17. Find the 3 cube roots of $-8i$. Leave answers in polar form with θ in degrees.

$\frac{360}{3} = 120°$

$-8i = [8, 270]^{1/3}$

$= [2, 90°]$

$= [2, 210°]$

$= [2, 330°]$

18. Find all exact solutions in standard complex form.

$x^4 - 81i = 0$ $\quad x^4 = [81, 270]^{1/4}$ $\quad \frac{360}{4} = 90°$

$x^4 = 81i$

$x = [3, 67.5] = \frac{3\sqrt{2+\sqrt{2}}}{2} + i\frac{3\sqrt{2-\sqrt{2}}}{2}$

$x = [3, 157.5] = -\frac{3\sqrt{2+\sqrt{2}}}{2} + i\frac{3\sqrt{2+\sqrt{2}}}{2}$

$x = [3, 247.5] = -\frac{3\sqrt{2+\sqrt{2}}}{2} - i\frac{3\sqrt{2-\sqrt{2}}}{2}$

$x = [3, 337.5] = \frac{3\sqrt{2+\sqrt{2}}}{2} - i\frac{3\sqrt{2+\sqrt{2}}}{2}$

$\sin 67.5 = \pm\sqrt{\frac{1-\frac{\sqrt{2}}{2}}{2}} = \sqrt{\frac{2-\sqrt{2}}{4}} = \frac{\sqrt{2-\sqrt{2}}}{2}$

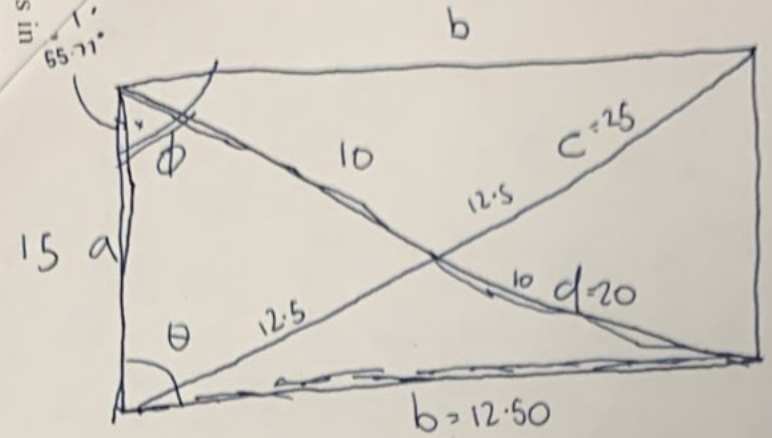
$\cos 67.5 = \pm\sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}} = \sqrt{\frac{2+\sqrt{2}}{4}} = \frac{\sqrt{2+\sqrt{2}}}{2}$

$\sin 157.5 = \pm\sqrt{\frac{1-\frac{\sqrt{2}}{2}}{2}} = \frac{\sqrt{2+\sqrt{2}}}{2}$

$\cos 157.5 = \pm\sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}} = \frac{\sqrt{2+\sqrt{2}}}{2}$

nswers in

$\frac{160}{3} = 160°$



c and d are the entire diagonal

Diagonals bisect each other in a parallelogram

$\frac{b}{\sin 55.77°} =$

$b^2 = 15^2 + 10^2 - 2(10)(15)\cos 55.77°$

$b = 12.50$

b=

$12.5^2 = 15^2 + 10^2 - 2(15)(10)\cos x$

$-168.75 = -2(15)(10)\cos x$

$\cos x = 0.5625$

$x = 55.77°$

18.

$x^4 - 81i = 0$

$x^4 = 81i \quad (0, 81)$

$\frac{360}{4} = 90°$

$\cos 22\frac{1}{2}° = \sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}} = \frac{\sqrt{2+\sqrt{2}}}{2}$

$\sin 22\frac{1}{2}° = \sqrt{\frac{1-\frac{\sqrt{2}}{2}}{2}} = \frac{\sqrt{2-\sqrt{2}}}{4}$

$[81, 90°] = [3, 22.5°]$

$= \frac{3\sqrt{2+\sqrt{2}}}{2} + \frac{3\sqrt{2-\sqrt{2}}}{2} i \quad (-y, x)$ ← rotate 90°

$= -\frac{3\sqrt{2-\sqrt{2}}}{2} + \frac{3\sqrt{2+\sqrt{2}}}{2} i$

$= -\frac{3\sqrt{2+\sqrt{2}}}{2} - \frac{3\sqrt{2-\sqrt{2}}}{2} i$

$= \frac{3\sqrt{2-\sqrt{2}}}{2} - \frac{3\sqrt{2+\sqrt{2}}}{2} i$

Hon Pre-Calc

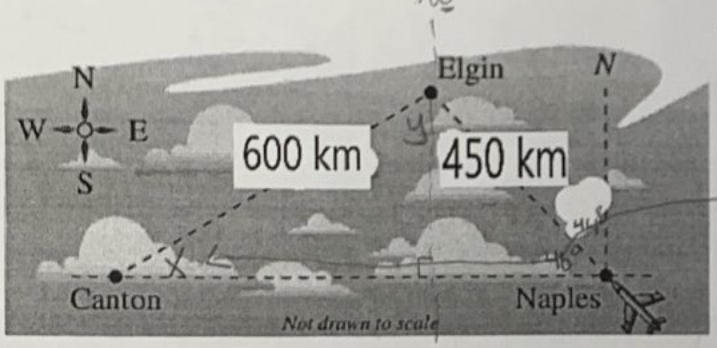
Test Chapter 6 Name [redacted]

Only Scientific Calculators Allowed!! Show All Work!! Circle All Final Answers!!

↓ +2 points of EC for every problem ↳ Happened after we failed initial test +10

Short Answer

1. A plane flies 450 kilometers with a bearing of 316° from Naples to Elgin (see figure). The plane then flies 600 kilometers from Elgin to Canton (Canton is due west of Naples). Find the bearing of the flight from Elgin to Canton. (Round answer to nearest 100th of a degree)



$\frac{\sin x}{450} = \frac{\sin 46}{600}$

$\sin x = 0.539350485$

$x = 32.64993822°$

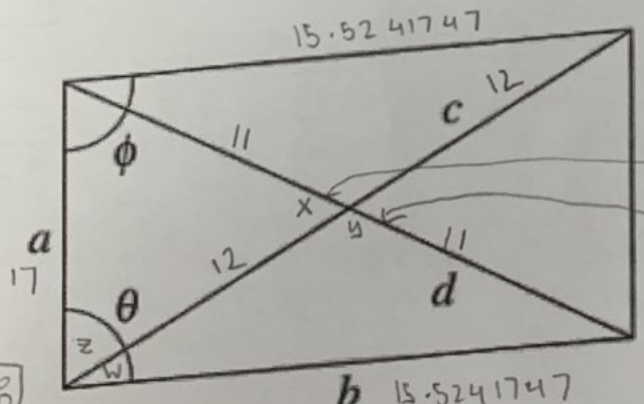
$y = 180 - (90 + x)$

$y = 57.35006178$

Bearing $= 180 + y$

$= \boxed{237.35°}$

2. Given $a = 17$, $c = 24$, and $d = 22$, Find the values of b, θ, and ϕ. (The figure below is a parallelogram). (Round all answers to nearest tenth)



$17^2 = 11^2 + 12^2 - 2(11)(12)\cos x$

$\cos x = -0.090900001$

$x = 95.21590857°$

$y = 84.78409143$

$\phi = 95.0°$

$b = 15.5$

$\theta = 85.0°$

$b^2 = (12)^2 + (11)^2 - 2(12)(11)\cos 84.78409143$

$b = \sqrt{15.5241747}$

$\frac{\sin 95.21590857}{17} = \frac{\sin z}{11}$

$z = 40.1191669°$

$\theta = z + w$

$\theta = 85.00295 63°$

$\phi = 180 - 85.00295 63°$

$\phi = 94.99704 37$

$\phi = 95°$

$\frac{\sin w}{11} = \frac{\sin 84.78409143}{15.5241747}$

$w = 44.88112873°$

3. Three forces with magnitudes of 80 pounds, 120 pounds, and 166 pounds act on an object at angles of 60°, 45°, and 120°, respectively, with the positive x-axis. Find the direction and magnitude of the resultant of these three forces. (Round all answers to nearest tenth)

a) Magnitude = $\text{Mag} = \sqrt{x^2+y^2}$ $= \boxed{300.8}$

$X = 80\cos 60 + 120\cos 45 + 166\cos 120$

$= 41.852813\overline{74}$

$y = 80\sin 60° + 120\sin 45° + 166\sin 120°$

$= 297.8952631$

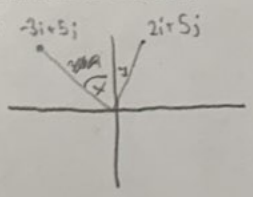
b) Direction =

$\tan^{-1}\left(\frac{y}{x}\right) = \boxed{82.0°}$

4. Find the angle (in degrees rounded to nearest 100th) between the vectors.

$\vec{u} = -3\mathbf{i} + 5\mathbf{j}$

$\vec{v} = 2\mathbf{i} + 5\mathbf{j}$



$\cos\theta = \frac{\vec{u}\cdot\vec{v}}{\|\vec{u}\|\cdot\|\vec{v}\|}$

$x = 30.96375653$

$y = 21.80140949$

$\theta = 52.77°$

$\cos\theta = \frac{19}{\sqrt{34}\cdot\sqrt{29}}$

$\boxed{\theta = 52.77°}$

5. Find all exact solutions in standard complex form.

$x^4 - 625i = 0$

$\tan^{-1}\left(\frac{-1}{0}\right) = 270°$

$\left[625, 90°\right]^{\frac{1}{4}}$ $\quad \frac{360°}{4} = 90°$

$\left[5, 22.5°\right] = \frac{5\sqrt{2+\sqrt{2}}}{2} + i\frac{5\sqrt{2-\sqrt{2}}}{2}$

$\left[5, 112.5°\right] = -\frac{5\sqrt{2-\sqrt{2}}}{2} + i\frac{5\sqrt{2+\sqrt{2}}}{2}$

$\left[5, 202.5°\right] = -\frac{5\sqrt{2+\sqrt{2}}}{2} - i\frac{5\sqrt{2-\sqrt{2}}}{2}$

$\left[5, 292.5°\right] = \frac{5\sqrt{2-\sqrt{2}}}{2} - i\frac{5\sqrt{2+\sqrt{2}}}{2}$

$\cos 22.5° = \sqrt{\frac{1+\left(\frac{\sqrt{2}}{2}\right)}{2}} = \sqrt{\frac{2+\sqrt{2}}{4}} = \frac{\sqrt{2+\sqrt{2}}}{2}$

$\sin 22.5° = \sqrt{\frac{1-\left(\frac{\sqrt{2}}{2}\right)}{2}} = \sqrt{\frac{2-\sqrt{2}}{4}} = \frac{\sqrt{2-\sqrt{2}}}{2}$