

MAC 1143 PRECALCULUS

EXAM 4 A

NAME _____

Chapters 8 and 11 (LHE)

SHOW ALL WORK ON THIS TEST OR ON SEPARATE PAPER. *SHOW ALL STEPS!!*
 Explain your calculations and procedures for partial credit.
 TURN IN ALL WORKSHEETS. CALCULATORS ARE REQUIRED ON THIS TEST.
 Describe windows, give key strokes, show what you did!!
 IN EACH EXERCISE, ALL SET UP ALL EQUATIONS BEFORE SOLVING!!!

1. Solve all triangles with $A = 61^\circ$, $B = 49^\circ$, and $c = 5396$.
Find the area of the triangle.
2. Solve all triangles with $A = 71^\circ$, $b = 10$, and $c = 19$.
Find the area of the triangle.
3. Solve all triangles with $B = 56^\circ$, $a = 98$, and $b = 85$.
4. Solve all triangles with $a = 135$, $b = 71.6$, and $c = 69$.
5. For the ASA, SSA, SAS, and SSS types of problems, which can be solved using the Law of Sines, and which require the Law of Cosines? For which types is it possible that there is "NO SOLUTION"? Make up examples of "NO SOLUTION" triangles.
6. Given a vector v with initial point $(2,5)$ and terminal point $(-1,9)$, find the magnitude and direction of v .
7. Given a vector v with magnitude 27 and direction $\theta = 216^\circ$, find the component form of v .
8. Two forces, one of 45 pounds and the other 52 pounds, act at an angle of 25° with respect to one another. Find the magnitude of the resultant force.
9. Given two vectors $v = 3i - 2j$ and $w = 6i + j$ with initial points at the origin. Find the angle between the vectors.
10. Sketch the graph of the parametric equations (label points or describe your window):

a) $X = 3 - 2t$	b) $X = 4 \sec t$
$Y = 2 + 3t$	$Y = 3 \tan t$
11. Sketch the graph of the polar equations (label points or describe your window):

a) $r = 3 \cos 3\theta$	b) $r = 10 - 10 \sin \theta$
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12. The angle of elevation to the top of a building is 20° . From a point 50 meters closer to the building, the angle of elevation is 38° . How tall is the building?
13. A plane flies 650 miles from A to B with a heading of $N 75^\circ E$. Then it flies 500 miles from B to C with a bearing of $N 32^\circ E$. Find the direct distance from A to C.

1. $A = 61^\circ$ $\frac{\sin 61}{a} = \frac{\sin 70}{5396}$
 $B = 49^\circ$
 $A+B = 110^\circ$ $a = \frac{5396 \sin 61^\circ}{\sin 70^\circ}$
 $= 5022.33$

$\frac{\sin 49^\circ}{b} = \frac{\sin 70^\circ}{5396}$
 $b = \frac{5396 \sin 49^\circ}{\sin 70^\circ}$
 $= 4333.77$

$A = \frac{1}{2} ab \sin C$
 $= \frac{1}{2} (5022.33)(4333.77)(\sin 70^\circ)$
 $= 10,226,503.97 \text{ units}$

2. $a^2 = b^2 + c^2 - 2bc \cos A$
 $b = 10$
 $c = 19$
 $a = \sqrt{337.284} = 18.365$

$\frac{\sin A}{a} = \frac{\sin B}{b}$
 $\frac{\sin 71^\circ}{18.365} = \frac{\sin B}{10}$
 $\sin B = \frac{10 \sin 71^\circ}{18.365}$
 $= .514848$
 $B = 30.99^\circ \approx 31^\circ$
 $A+B = 102^\circ$
 $C = 78^\circ$

Area = $\frac{1}{2} bc \sin A$
 $= \frac{1}{2} 10 \cdot 19 \sin 71^\circ$
 $= 89.82 \text{ units}$

3. $B = 56^\circ$ $a = 98$ $b = 85$ Two Possible Cases:

$\frac{\sin A_1}{98} = \frac{\sin 56}{85}$
 $\sin A_1 = \frac{98 \sin 56}{85}$
 $= .9558$
 $A_1 = 72.91^\circ$
 $A_2 = 180 - 72.91$
 $= 107.09^\circ$

$A+B = 128.91$
 $C_1 = 180 - (\downarrow)$
 $C_1 = 51.09^\circ$

$\frac{\sin 51.09}{c_1} = \frac{\sin 56}{85}$
 $c_1 = \frac{85 \sin 51.09}{\sin 56}$
 $c_1 = 79.78$

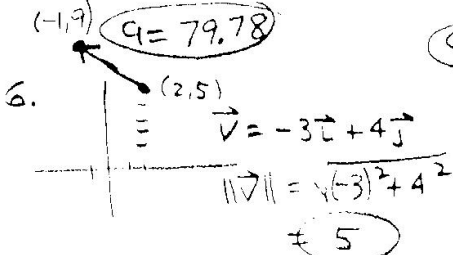
$A_2 = 107.09^\circ$
 $A+B = 163.09$
 $C_2 = 180 - (\downarrow)$
 $C_2 = 16.91^\circ$

$\frac{\sin 16.91}{c_2} = \frac{\sin 56}{85}$
 $c_2 = \frac{85 \sin 16.91}{\sin 56}$
 $c_2 = 29.82$

4. $a = 135$ $b = 71.6$ $c = 69$
 $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$
 $= \frac{71.6^2 + 69^2 - 135^2}{2(71.6)(69)}$
 $= -.8438$
 $A = 147.54^\circ$

$\frac{\sin B}{71.6} = \frac{\sin 147.54^\circ}{135}$
 $\sin B = \frac{71.6 \sin 147.54^\circ}{135}$
 $= .2846256$
 $B = 16.54^\circ$
 $A+B = 164.08$
 $C = 180 - (\downarrow)$
 $C = 15.92^\circ$

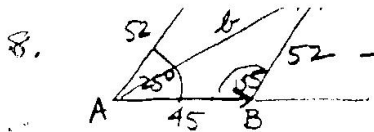
5. Law of Sines ASA, SSA
 Law of Cosines SAS, SSS
 "No Solution" is a possibility only for SSA and SSS triangles.
 EXAMPLES: SSA SSS



\Rightarrow \vec{v} is 85 keystrokes
 2nd Vector, FS (copy), FS (angle) $[-3, 4] = 126.87^\circ$

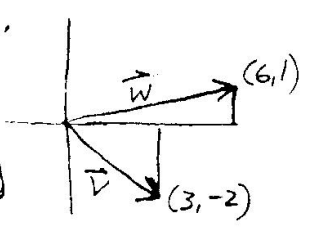
$\text{or } \theta = \arctan \frac{4}{-3}$ in QII.
 $= -53.13 + 180 = 126.87^\circ$

7. $\|\vec{v}\| = 27$, $\theta = 216^\circ$ or $[27 < 216]$
 $\vec{v} = \|\vec{v}\| (\cos \theta \vec{i} + \sin \theta \vec{j})$
 $= 27 [\cos 216, \sin 216]$
 $= [-21.84, -15.87]$
 $= -21.84\vec{i} - 15.87\vec{j}$

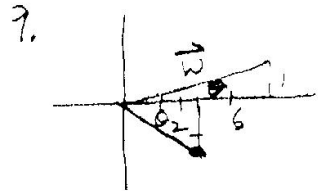


8. $180 - 25 = 155^\circ$
 use SAS to find b
 $b^2 = a^2 + c^2 - 2ac \cos B$
 $= 45^2 + 52^2 - 2(45)(52) \cos 155^\circ$
 $b^2 = 8970.52$
 $b = 94.71 \text{ lbs.}$

TI 85 Spac inv:
 $[45 \angle 0] + [52 \angle 25] \text{ Enter}$
 2nd Vector F3 (math)
 F3 (norm) 2nd ans Enter

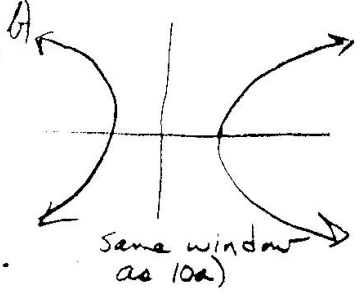


7.
 $|\vec{W}| = \sqrt{6^2 + 1^2} = \sqrt{37}$
 $|\vec{V}| = \sqrt{3^2 + 2^2} = \sqrt{13}$
 $|\vec{W} - \vec{V}| = \sqrt{3^2 + 3^2} = \sqrt{18}$ (Distance Formula!)
 Use (SS) to find angle A.
 $\cos A = \frac{b^2 + c^2 - a^2}{2bc} = \frac{37 + 13 - 18}{2\sqrt{37} \cdot \sqrt{13}}$
 $\cos A = .729537$
 $A = 43.15^\circ$

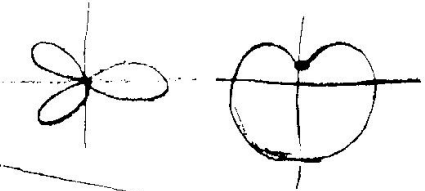


9.
 $\tan \theta_1 = \frac{1}{6}$ $\tan \theta_2 = -\frac{2}{3}$
 $\theta_1 = 9.46^\circ$ $\theta_2 = -33.69^\circ$
 $\theta = 9.46 + 33.69 = 43.15^\circ$

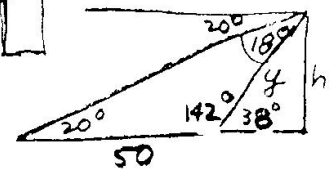
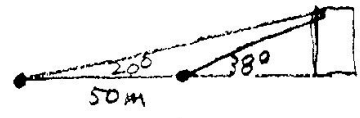
10a) PARAM. FORMAT
 $t: -360 \text{ to } 360$
 $x: -10 \text{ to } 10$
 $y: -10 \text{ to } 10$
 Be sure to use positive and negative t values.



11. POLAR FORMAT
 a) $t: 0 \text{ to } 360$ $t: 0 \text{ to } 360$
 $x: -4 \text{ to } 4$ $x: -20 \text{ to } 20$
 $y: -4 \text{ to } 4$ $y: -30 \text{ to } 10$



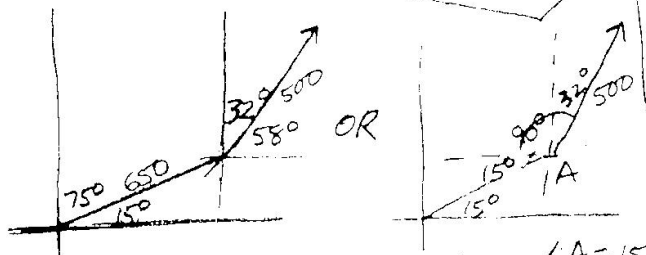
12.



ASA triangle
 $180 - 38^\circ = 142^\circ$
 $142^\circ + 20^\circ = 162^\circ$
 $180^\circ - 162^\circ = 18^\circ$
 $\frac{\sin 20^\circ}{y} = \frac{\sin 18^\circ}{50}$
 $y = \frac{50 \sin 20^\circ}{\sin 18^\circ}$
 $= 55.34$

$\sin 38^\circ = \frac{h}{y}$
 $\sin 38^\circ = \frac{h}{55.38}$
 $h = 66.07 \sin 38^\circ$
 $= 34.07 \text{ m.}$

13.



$[350 \angle 15] + [500 \angle 58]$
 $= 1071.39$

$\angle A = 15^\circ + 90^\circ + 32^\circ = 137^\circ$ (SAS)
 $a^2 = b^2 + c^2 - 2bc \cos A$
 $a^2 = 650^2 + 500^2 - 2(650)(500) \cos 137^\circ$
 $a^2 = 1147879.906$
 $a = 1071.39$