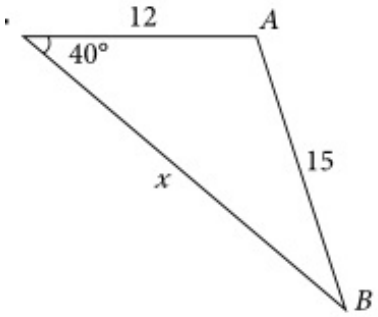
NAME _____

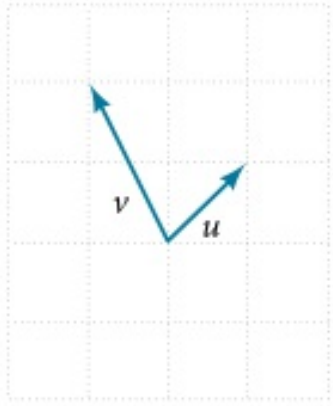
MATH 114: FALL 2021	TEST 3

You may use the provided unit-circle and formula sheet. You are also allowed a 3x5 inch card of notes.

Problem 1: (5pts) Find x.



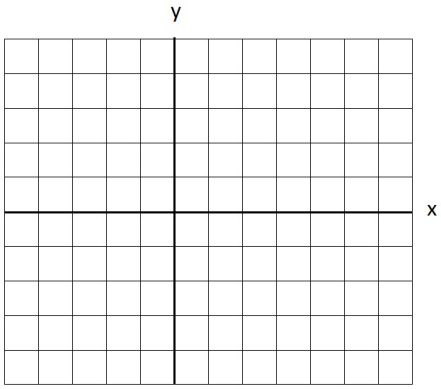
Problem 2: Plot the vectors $\vec{u}+\vec{v}$ and $-2\vec{u}$ for $\vec{u}$ and $\vec{v}$ as given below:



Problem 3: Find the Cartesian form z_1 and z_2. Also, plot z_1 and z_2 as points in the graph.

(a.) $z_1 = 5e^{i\pi/3}$,

(b.) $|z_2| = 4$ and $\angle z_2 = 210^o$,



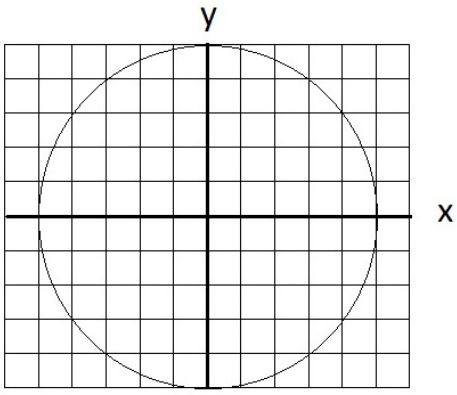
Problem 4: If $\vec{A}$ has $A = 5$ and standard angle 45^o and $\vec{B}$ has $B = 5$ and standard angle 180^o then,

(a.) find the Cartesian forms of $\vec{A}$ and $\vec{B}$,

(b.) algebraically calculate $\vec{A} + \vec{B}$,

(c.) find the magnitude and standard angle of $\vec{A} + \vec{B}$,

(d.) plot $\vec{A} + \vec{B}$ as it relates to $\vec{A}$ and $\vec{B}$ via the the tip-to-tail vector addition rule.



Problem 5: Write the following complex numbers in polar form.

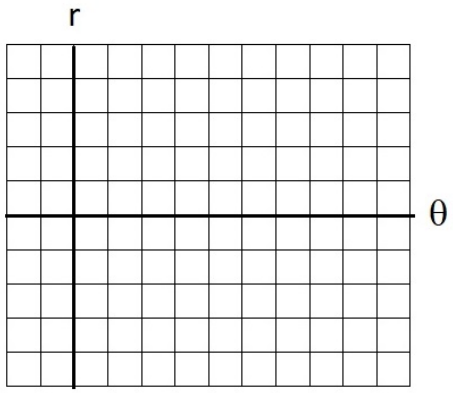
(a.) $z = -2 - 2i$,

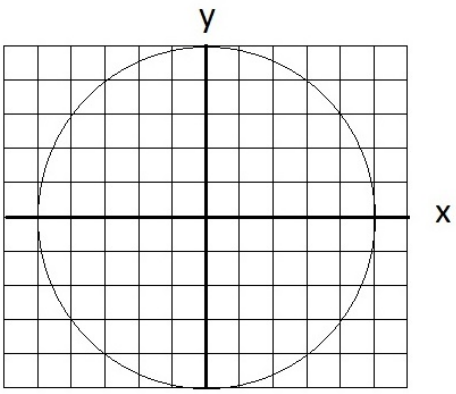
(b.) $z = 3i$,

Problem 6: Let $z = 3 + i$ and $w = -1 + i$. Find the Cartesian and polar forms of $(z + w)^{10}$.

Problem 7: Find the polar form of the equation $x^2 + 2x + y^2 = 0$.

Problem 8: Graph $r = 5\sin(4\theta)$ using the grids given below:





Problem 9: (4pts) Find the standard angle (in degrees) and magnitude of each of the following vectors:

(a.) $\vec{C} = \langle -3, -4 \rangle$

(b.) $\vec{D} = \langle 0, -10 \rangle$

Problem 10: Let $\vec{A} = \langle 1, 2, -2 \rangle$ and $\vec{B} = \langle 3, 0, 4 \rangle$.

(a.) find the magnitudes of $\vec{A}$ and $\vec{B}$

(b.) calculate $\vec{A} \bullet \vec{B}$

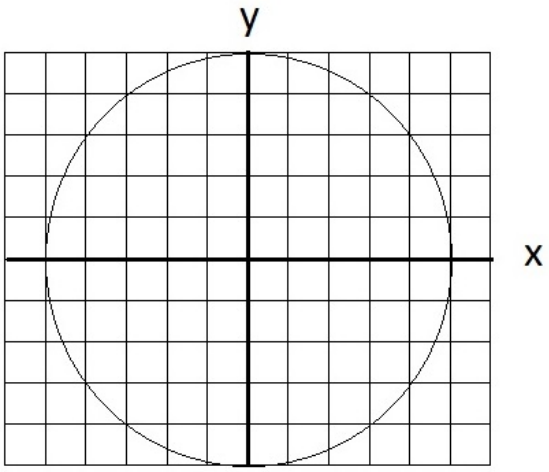
(c.) find the angle between $\vec{A}$ and $\vec{B}$

(d.) are the vectors parallel, perpendicular or neither ?

Problem 11: Let $\vec{A} = \langle 1, 2, -2 \rangle$ and $\vec{B} = \langle 0, 1, 1 \rangle$. Calculate $\vec{A} \times \vec{B}$.

Problem 12: (2pts) Let $P = (0, 0, 0)$ and $Q = (1, 3, 4)$ and $R = (0, -4, 3)$. Find the interior angles and the area of the triangle PQR. Is this triangle oblique ? *hint: use vectors*

Problem 13: Let $z = 625\exp(2\pi i/3)$. Calculate $\sqrt[4]{z}$ and all four complex numbers in $z^{1/4}$. Also, plot each answer in the complex plane provided below:



Problem 14: Use the formulas $\cos\theta = \frac{1}{2}\left(e^{i\theta} + e^{-i\theta}\right)$ and $\sin\theta = \frac{1}{2i}\left(e^{i\theta} - e^{-i\theta}\right)$ to derive the identity $\cos(2x)\sin(3x) = \dfrac{1}{2}\sin(x) + \dfrac{1}{2}\sin(5x)$.