Precalc Review for Chapter 6 Test Name DiMarco

Sections: 6.1, 6.3, 6.4, 6.5

Let u = <-4, -1>, v = <1, 3>, and w = <-6, -3>. Find:

1. u + 2v - w

$\langle -4,-1\rangle + 2\langle 1,3\rangle - \langle -6,-3\rangle$

$\langle -4,-1\rangle + \langle 2,6\rangle + \langle 6,3\rangle$

$= \boxed{\langle 4,8\rangle}$

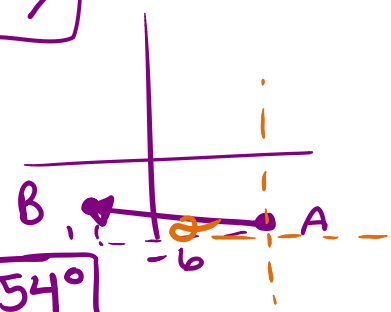
2. Find the component form of a vector AB with A = (4, -3) and B = (-2, -2).

$\overrightarrow{AB} = \langle -2-4, -2--3\rangle = \boxed{\langle -6,1\rangle}$

3. Find the magnitude and direction angle of the vector in #2.

$|AB| = \sqrt{1^2+6^2} = \boxed{\sqrt{37}}$

$\theta = \tan^{-1}\left(\frac{1}{6}\right) = 9.46^\circ$ dir. $\angle = 180-\theta = \boxed{170.54^\circ}$

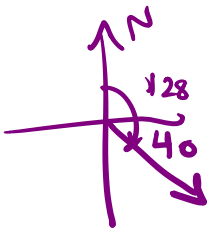


$v = \langle 10\cos 218^\circ, 10\sin 218^\circ\rangle$

4. A ship sails at a bearing of 128 degrees and at a speed of 40 knots. Find the component form of the velocity vector of the ship. OR $\boxed{450-\text{Bearing}}$

$\langle 40\cos 322^\circ, 40\sin 322^\circ\rangle$ $\langle 31.52, -24.63\rangle$

31.52 knots East, 24.63 knots South



$\theta = 128-90^\circ = 38^\circ$

$\langle 40\cos(-38^\circ), 40\sin(-38^\circ)\rangle$

Eliminate the parameter and identify the type of graph it is.

5. $x = 2t^2 + 3$, $y = t - 1$

① $x-3 = 2t^2$

$t^2 = \frac{x-3}{2}$

$t = \pm\sqrt{\frac{x-3}{2}}$

② $\boxed{y = \pm\sqrt{\frac{x-3}{2}} - 1}$

Square Root Graph

6. x = 3cost, y = 3sint

$\cos t = \frac{x}{3}$ $\sin t = \frac{y}{3}$

$\cos^2 t + \sin^2 t = 1$ (Pyth. Id)

$\left(\frac{x}{3}\right)^2 + \left(\frac{y}{3}\right)^2 = 1$

$\frac{x^2}{9} + \frac{y^2}{9} = 1$

$\boxed{x^2+y^2=9}$

circle w/radius=3 center (0,0)

Find a parametrization for each. Be sure to state the limits on T.

7. The line *segment* through points (-5, 5) and (1, 3).

A B

$\vec{AB} = \langle 6, -2 \rangle$

$$\boxed{\begin{aligned} X &= -5 + 6T \\ Y &= 5 - 2T \\ T &: [0, 1] \end{aligned}}$$

or

$$\boxed{\begin{aligned} X &= 1 - 6T \\ Y &= 3 + 2T \\ T &: [0, 1] \end{aligned}}$$

8. A circle with radius of 6 and center at (4, 5).

$$\boxed{\begin{aligned} X &= 6\cos T + 4 \\ Y &= 6\sin T + 5 \\ T &: [0, 2\pi) \end{aligned}}$$

9. Stewart shoots an arrow straight up from the top of a building with initial velocity of 245 ft/sec. The arrow leaves from a point 200 feet above the ground.

a) Write parametric equations to model the height of the arrow. (Make X = some #)

$X = 5 \qquad Y = -16T^2 + 245T + 200$

T: 0–20
Tstep: .1
X: 0, 10
Y: 0, 1500

b) How high is the arrow after 4 seconds? (round to the hundredth)

$T = 4$ 925 ft (exactly)

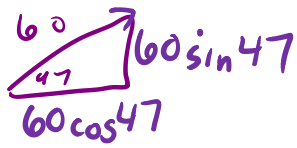
c) What is the maximum height of the arrow? When does it reach that height?

1137.89 ft 7.66 sec (I used Trace)

d) When will the arrow hit the ground?

16.09 sec (zoom + trace)

10. Junior practices kicking field goals 40 yards from a goal post with a crossbar that is 10 feet high. If he kicks the ball with an initial velocity of 60 feet per second at a 47 degree angle with the ground, will he make a field goal (clear the cross bar)? (Write parametric equations and use your calculator to graph.)



Football:

X = $60\cos(47)T$

Y = $-16T^2 + 60\sin(47)T$

Cross Bar: (vertical line)

X = $40(3) = 120$ ft

Y = $10 - 10T$

Window
T: 0–5
Tstep .1
X: 0–130
Y: 0–30

No!

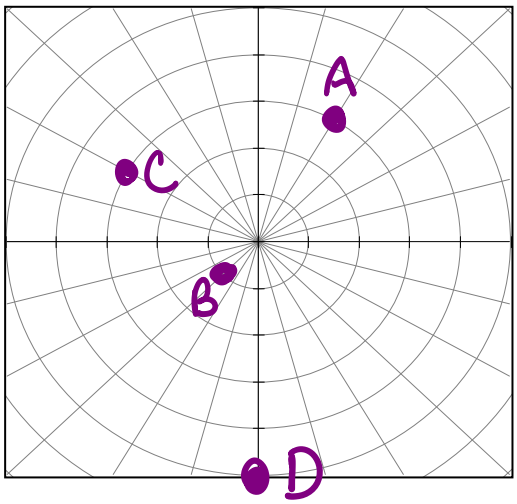
11. Plot the points on the polar grid. Label all points.

A) $(3, \frac{\pi}{3})$

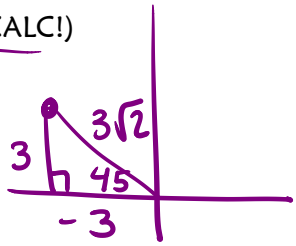
B) $(1, -135^\circ)$

C) $(-3, 330^\circ)$

D) $(-5, -\frac{3\pi}{2})$



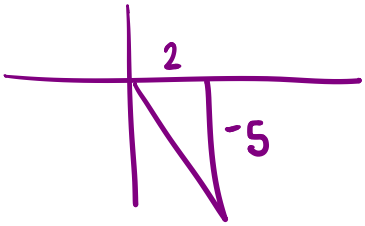
12. Change (-3, 3) to Polar Coordinates. Give two answers – one with a positive r and one with a negative r. (NO CALC!)



$(3\sqrt{2}, 135^\circ)$

$(-3\sqrt{2}, -45^\circ)$

13. Change (2, -5) to Polar Coordinates. Give two answers – one with a positive r and one with a negative r. (CALC OK!)



$r = \sqrt{2^2 + 5^2}$

$r = \sqrt{29}$

$\theta = \tan\left(\frac{-5}{2}\right) = -68.20^\circ$

$(\sqrt{29}, -68.20^\circ)$

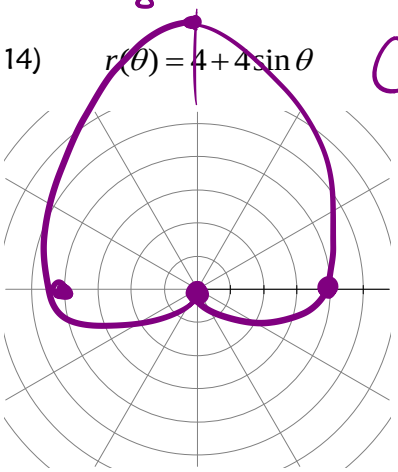
$(-\sqrt{29}, 111.80^\circ)$

For questions 14 - 20, identify each of the following as a line, circle, rose, cardioid, or limacon. Then graph each equation.

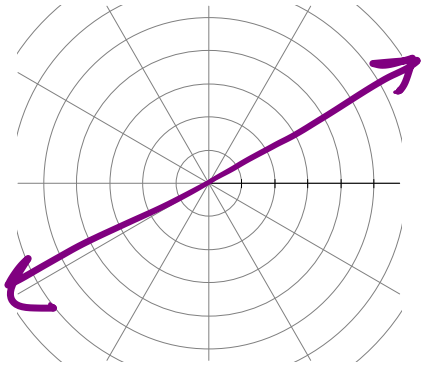
DO NOT USE A CALCULATOR!!

14) $r(\theta) = 4 + 4\sin\theta$ Cardioid

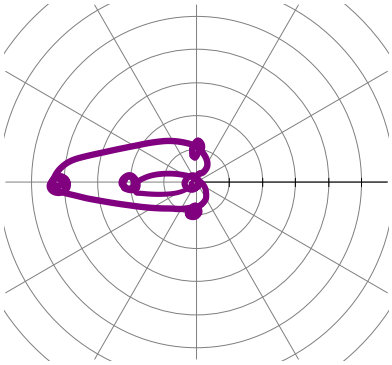
8



15) $\theta = \frac{\pi}{6}$ Line

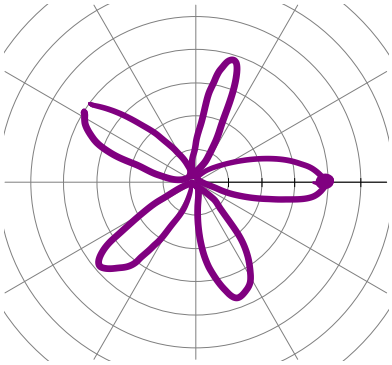


16) $r(\theta) = 1 - 3\cos\theta$ Limacon



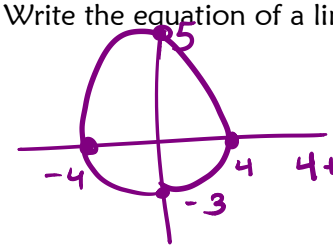
$3-1=2$
$3+1=4$

17) $r(\theta) = 4\cos 5\theta$ Rose



5 petals
$\frac{360}{5} = 72°$ placement

18) Write the equation of a limacon that has x-intercepts at 4 and -4, and y-intercepts at 5 and -3.



$a = 4$
$4 + b = 5$
$b = 1$

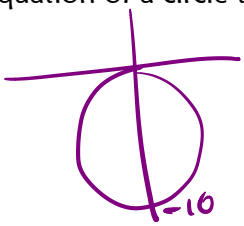
$\boxed{r = 4 + 1\sin\theta}$

19) Write the equation of a rose with 8 petals, length 2, the first one placed at 22.5°. $\sin\frac{90}{4} = 22.5$ ✓

$n = 4$

$\boxed{r = 2\sin 4\theta}$

20) Write the equation of a circle that lays on the negative y-axis, with y-intercepts of 0 and -10.



$\boxed{r = -10\sin\theta}$