

As a reminder, you are welcome to use a non-internet accessing calculator (which includes Desmos Test Mode) but no books, other notes, or peers.

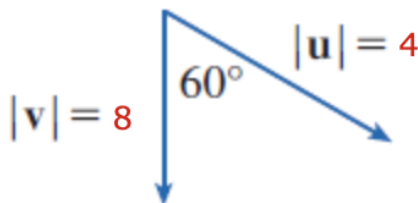
1. [9] TRUE/FALSE: Write True in each of the following cases if the statement is *always* true and provide a brief justification. Otherwise, write False and provide a counterexample or brief justification.

(a) (Quiz2#1) If \vec{v} and \vec{w} are vectors in \mathbb{R}^3 so that $\vec{v} \cdot \vec{w} \neq 0$ (that is, the dot product of vectors v and w), then \vec{v} and \vec{w} are not perpendicular or parallel.

(b) (§13.2#26) If $\vec{r}(t) = \langle 3^t, t \cos(2t), t^3 - 3t \rangle$, then the line tangent to $\vec{r}(1)$ is:

$$\langle x, y, z \rangle = \langle 1, 1, -2 \rangle + \langle 3^t(\ln 3), -2t \sin(2t) + \cos(2t), 3t^2 - 3 \rangle$$

2. (WebHW12.4 #3) Find $\vec{u} \times \vec{v}$ given the information on the right.

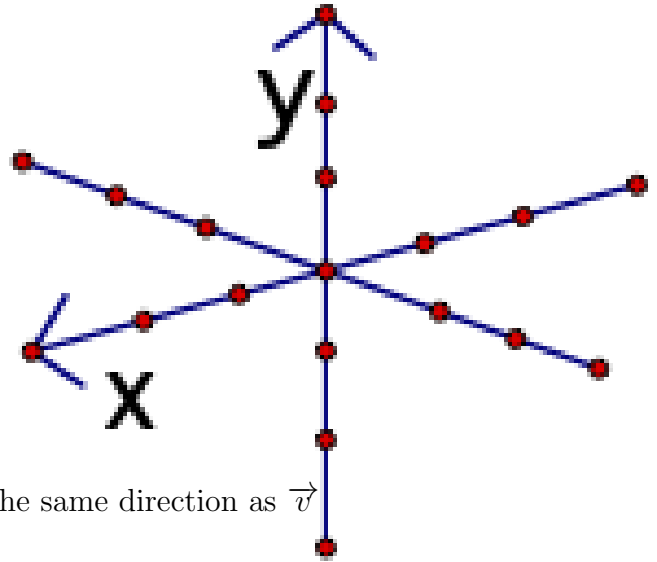


Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

3. Consider the points $P(1, 2, 3)$ and $Q(1, 0, 4)$.
Let $\vec{v} = \langle 0, -2, 1 \rangle$.

(a) [2] (Quiz1#1) Label the positive z axis
and then plot the vector \vec{PQ}

(b) [1] (PracticeExam1#2)
Find the components of \vec{PQ} .



(c) [2] (WebHW12.2#7) Find a unit vector in the same direction as \vec{v}

(d) [3] (WebHW12.3#6) Find the angle \vec{PQ} makes with \vec{v} .

(e) [3] (Quiz2 #1) Find an equation of a plane passing through $(0, -2, 1)$ and normal/orthogonal/perpendicular to \vec{v}

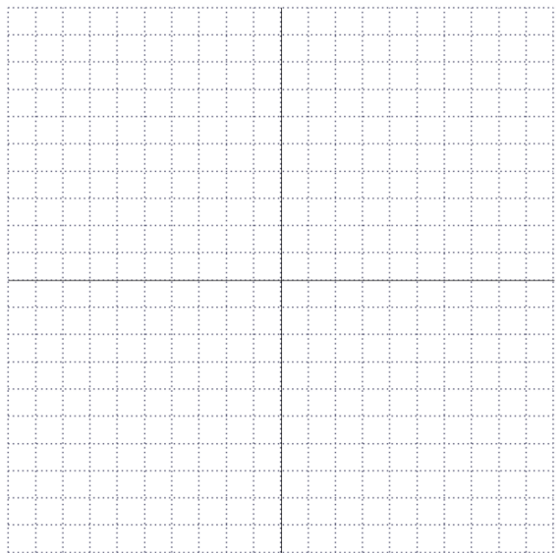
4. [3] (WrittenHW12.3 #50) A force is given by a vector $\vec{F} = 3\vec{i} + 4\vec{j} + 5\vec{k}$ and moves a particle from $P(2, 1, 0)$ to $Q(4, 6, 2)$. Find the work done.

5. (WordProblem #2) A plane is flying at 90 knots 16° north from due east.

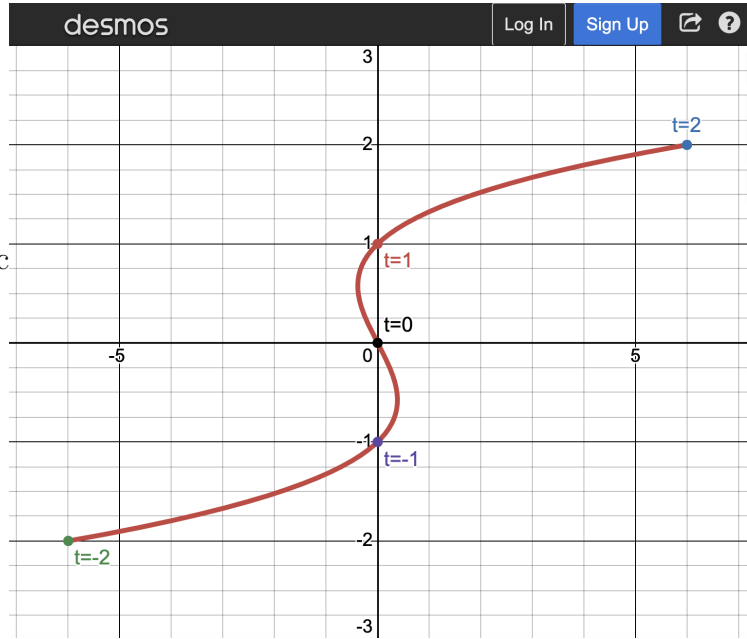
(a) [1] Identify east on the axis and sketch the velocity vector of the plane.

(b) [1] Find the components of the velocity vector of the plane.

(c) [3] The air is moving (wind) with the speed of 25 knots in the direction of -98° from due east. What is the plane's actual heading (direction)?



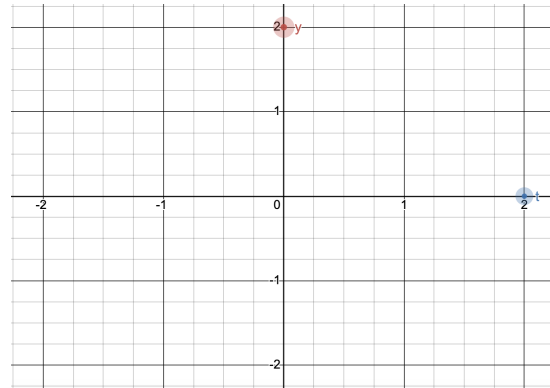
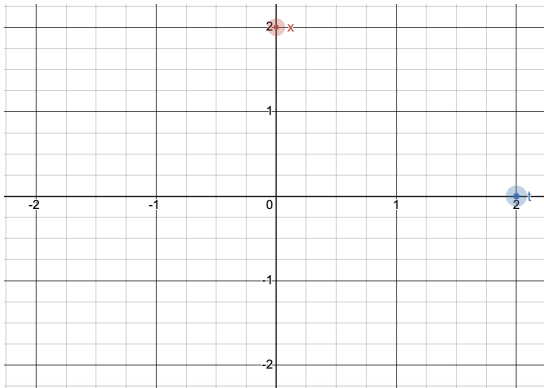
6. Consider the parametric curve $x = f(t)$, $y = g(t)$ where $-2 \leq t \leq 2$, graphed below for the following questions.



- (a) [1] Identify/Estimate the point on the parametric curve when $t = -0.5$.

- (b) [1] (PracticeExam1 #4) Identify/Estimate a point where $\frac{dy}{dx}$ is not defined.

- (c) [6] (WrittenHW§10.1#32) Sketch the equations $x = f(t)$ and $y = g(t)$ on the pair of axis below.



- (d) [4] (WebHW10.2#3) Given the following information, find the line tangent to the curve $x = f(t)$, $y = g(t)$ when $t = \frac{3}{2}$. Use whatever form of a line you like (eg. parametric, slope-intercept, standard, etc)

$$f\left(\frac{3}{2}\right) = 1.9 \quad g\left(\frac{3}{2}\right) = 1.5 \quad \frac{df}{dt}\left(\frac{3}{2}\right) = 2.8 \quad \frac{dg}{dt}\left(\frac{3}{2}\right) = 1$$