

**Instructions:** Show all work. Use exact answers unless specifically asked to round.

1. Find the cross product of  $\vec{u} = \langle 1, 3, 4 \rangle, \vec{v} = \langle 5, -2, -3 \rangle$ .

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 3 & 4 \\ 5 & -2 & -3 \end{vmatrix} = (-9+8)\hat{i} - (-3-20)\hat{j} + (-2-15)\hat{k} = \boxed{-\hat{i} + 23\hat{j} - 17\hat{k}}$$

2. Sketch the graph of  $\vec{r}(t) = 2 \cos(t) \hat{i} + 2 \sin(t) \hat{j} + \frac{1}{2} t \hat{k}$ . Create a table of values to be plotted. Use a right-handed coordinate system. Plot roughly 10 points (your graph should show two complete loops of the helix).

t	x	y	z	
$-2\pi$	2	0	$-\frac{2\pi}{2} = -\pi \approx -3.14$	A
$-\frac{3\pi}{2}$	0	2	$-\frac{3\pi}{4}$	B
$-\pi$	-2	0	$-\frac{\pi}{2} \approx -1.57$	C
$-\frac{\pi}{2}$	0	-2	$-\frac{\pi}{4}$	D
0	2	0	0	E
$\frac{\pi}{2}$	0	2	$\frac{\pi}{4}$	F
$\pi$	-2	0	$\frac{\pi}{2} \approx 1.57$	G
$\frac{3\pi}{2}$	0	-2	$\frac{3\pi}{4}$	H
$2\pi$	2	0	$\pi \approx 3.14$	I

