Which of the following gives a parametrization of the line in $\mathbb{R}^3$ which passes through the point $(0, 0, 1)$ and is parallel to the vector $\langle 2, -1, 0 \rangle$.

(a) $\mathbf{r}(t) = \langle 0, 0, 1 \rangle + t\langle 2, -1, 0 \rangle$

(b) $\mathbf{r}(t) = \langle -2, 1, 1 \rangle + t\langle 2, -1, 0 \rangle$

(c) $\mathbf{r}(t) = \langle 0, 0, 1 \rangle + t\langle -2, 1, 0 \rangle$

(d) $\mathbf{r}(t) = \langle -2, 1, 1 \rangle + t\langle 4, -2, 0 \rangle$

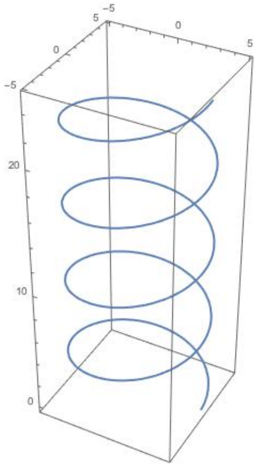
(e) All of the above.

Correct answer: (e)

Things we're not covering:

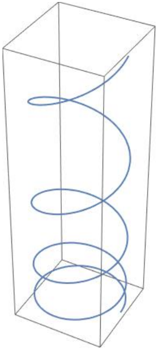
1. curvature
2. normal vectors, binormal vectors
3. tangent and normal components of acceleration

A helix



Practice with space curve parametrizations

Consider the following curve. Which of the equations could be a parametrization?



(a) $\mathbf{r}(t) = \langle \cos t, \sin t, t \rangle$.

(b) $\mathbf{r}(t) = \langle \cos t, t, \sin t \rangle$.

(c) $\mathbf{r}(t) = \langle \cos t, \sin t, \frac{1}{t} \rangle$.

(d) $\mathbf{r}(t) = \langle \cos t, \sin t, t^2 \rangle$.

(e) None of these.

Correct answer: (d)

Finding arc-length

Consider the curve parametrized by $\mathbf{r}(t) = \langle t, \sqrt{1 - t^2} \rangle$, $-1 \leq t \leq 1$. What is its length?

Hint: Sketch a picture.

(a) I can't remember how to calculate the integral.

(b) π

(c) $2\sqrt{2}$

(d) 2π

(e) $\sqrt{2}$

Correct answer: (b)