

Section 14.3–15.2 Review

See full summaries at the end of each of these sections in the course textbook.

Brief Summary of 14.3

- The length s of a path $\mathbf{r}(t) = \langle x(t), y(t), z(t) \rangle$ for $a \leq t \leq b$ is _____.
- The arc length function: $s(t) =$ _____.
- Speed is the derivative of distance traveled with respect to time:

$$v(t) = \frac{ds}{dt} = \text{_____}.$$

Section 14.3 Additional Exercises

1. Find the speed at the time $t = 4$ of $\mathbf{r}(t) = \langle 2t + 3, 4t - 3, 5 - t \rangle$.
2. Compute the length of the curve $\mathbf{r}(t) = \langle 2t, \ln t, t^2 \rangle$ over the interval $1 \leq t \leq 4$.
3. Find an arc length parametrization of the cycloid with parametrization $\mathbf{r}(t) = \langle t - \sin t, 1 - \cos t \rangle$.

Section 15.1 Additional Exercises

1. Draw a contour map of the following functions. Include at least five level curves: $f(x, y) = xy$ and $f(x, y) = 3x^2 - y^2$.

Section 15.2 Additional Exercises

Evaluate the following limits or show that they do not exist.

1.

$$\lim_{(x,y) \rightarrow (2,-1)} (xy - 3x^2y^3)$$

2.

$$\lim_{(x,y) \rightarrow (\pi/4,0)} \tan x \cos y$$

3.

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x}{x^2 + y^2}$$

4.

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - y^2}{\sqrt{x^2 + y^2}}$$

5. Is the following function continuous?

$$f(x, y) = \begin{cases} x^2 + y^2 & \text{if } x^2 + y^2 < 1 \\ 1 & \text{if } x^2 + y^2 \geq 1 \end{cases}$$

6. Evaluate the limit

$$\lim_{(x,y) \rightarrow (0,2)} (1+x)^{y/x}.$$