Extra Practice for Section I: Chapter 5

1. Determine the domain of $y = \tan(t)$.

Click here to see the solution to **1.**

2. Determine the domain of $y = \sec(t)$.

Click here to see the solution to **2.**

3. Determine the domain of $y = \cot(t)$.

Click here to see the solution to **3.**

4. Determine the domain of $y = \csc(t)$.

Click here to see the solution to **4.**

Solution to **1.**

1. Determine the domain of $y = \tan(t)$.

Since $\tan(t) = \frac{\sin(t)}{\cos(t)}$, $y = \tan(t)$ is undefined where $\cos(t) = 0$. Recall that $\cos(t) = 0$ when $t = \frac{\pi}{2}$ and $t = \frac{3\pi}{2}$ and all angles coterminal with these two angles. One way to express these values is like this:

$$\left\{t \,\middle|\, t = \tfrac{\pi}{2} + 2k\pi \text{ for all } k \in \mathbb{Z}\right\} \cup \left\{t \,\middle|\, t = \tfrac{3\pi}{2} + 2k\pi \text{ for all } k \in \mathbb{Z}\right\}$$

This set can be simplified and expressed as:

$$\left\{t \,\middle|\, t = \tfrac{\pi}{2} + k\pi \text{ for all } k \in \mathbb{Z}\right\}.$$

(To verify that this simplification is correct, choose a value represented in the unsimplified set and check if it's represented in the simplified set.)

The domain of $y = \tan(t)$ is all real numbers *except* the values listed above where $\cos(t) = 0$. Thus, the domain of $y = \tan(t)$ is:

$$\left\{t \,\middle|\, t \in \mathbb{R} \text{ and } t \neq \tfrac{\pi}{2} + k\pi \text{ for all } k \in \mathbb{Z}\right\}.$$

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Solution to **2.**

2. Determine the domain of $y = \sec(t)$.

Since $\sec(t) = \frac{1}{\cos(t)}$, $y = \sec(t)$ is undefined where $\cos(t) = 0$. In #1, we observed that these values can be represented by the following set:

$$\left\{t \,\middle|\, t = \tfrac{\pi}{2} + k\pi \text{ for all } k \in \mathbb{Z}\right\}.$$

The domain of $y = \sec(t)$ is all real numbers *except* the values listed above where $\cos(t) = 0$. Thus, the domain of $y = \sec(t)$ is:

$$\left\{t \,\middle|\, t \in \mathbb{R} \text{ and } t \neq \tfrac{\pi}{2} + k\pi \text{ for all } k \in \mathbb{Z}\right\}.$$

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Solution to **3.**

3. Determine the domain of $y = \cot(t)$.

Since $\cot(t) = \frac{\cos(t)}{\sin(t)}$, $y = \tan(t)$ is undefined where $\sin(t) = 0$. Recall that $\sin(t) = 0$ when $t = 0$ and $t = \pi$ and all angles coterminal with these two angles. One way to express these values is like this:

$$\{t \mid t = 2k\pi \text{ for all } k \in \mathbb{Z}\} \cup \{t \mid t = \pi + 2k\pi \text{ for all } k \in \mathbb{Z}\}$$

This set can be simplified and expressed as:

$$\{t \mid t = k\pi \text{ for all } k \in \mathbb{Z}\}.$$

(To verify that this simplification is correct, choose a value represented in the unsimplified set and check if it's represented in the simplified set.)

The domain of $y = \cot(t)$ is all real numbers *except* the values listed above where $\sin(t) = 0$. Thus, the domain of $y = \cot(t)$ is:

$$\{t \mid t \in \mathbb{R} \text{ and } t \neq k\pi \text{ for all } k \in \mathbb{Z}\}.$$

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Solution to **4.**

4. Determine the domain of $y = \csc(t)$.

Since $\csc(t) = \frac{1}{\sin(t)}$, $y = \csc(t)$ is undefined where $\sin(t) = 0$. In #3, we observed that these values can be represented by the following set:

$$\{t \mid t = k\pi \text{ for all } k \in \mathbb{Z}\}.$$

The domain of $y = \csc(t)$ is all real numbers *except* the values listed above where $\sin(t) = 0$. Thus, the domain of $y = \csc(t)$ is:

$$\{t \mid t \in \mathbb{R} \text{ and } t \neq k\pi \text{ for all } k \in \mathbb{Z}\}.$$

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