

Ans. Key

Math 2551 A1-3 Exercise 20

Section:

Name:

Student Number:

The polar coordinate change maps a region G in the θr plane to another region R in the xy plane. Let R be bounded by 4 curves $y = x^2$, $x = 2$, $x = 1$ and $y = 10$. Then G must be bounded by which of the following curves? (Mark "true" or "false" for each).

True (A) $r = 2 \sec \theta$.

True (B) $r = \sec \theta$.

True (C) $r = 10 \csc \theta$.

False (D) $r = \tan \theta$.

Polar coord. change:
$$\begin{cases} x = r \cos \theta \\ y = r \sin \theta \end{cases}$$

Plug in each of the 4 boundary curves:

$$y = x^2 \rightarrow r \sin \theta = r^2 \cos^2 \theta \Rightarrow r = \tan \theta \sec \theta$$

$$x = 2 \rightarrow r \cos \theta = 2 \Rightarrow r = 2 \sec \theta$$

$$x = 1 \rightarrow r \cos \theta = 1 \Rightarrow r = \sec \theta$$

$$y = 10 \rightarrow r \sin \theta = 10 \Rightarrow r = 10 \csc \theta$$