Use the table of selected values for the polar function $r = f(\theta)$ to answer the following.

1.

θ	0	$\dfrac{\pi}{4}$	$\dfrac{\pi}{2}$	$\dfrac{3\pi}{4}$	π	$\dfrac{5\pi}{4}$	$\dfrac{3\pi}{2}$	$\dfrac{7\pi}{4}$	2π
r	3	-1.24	-3	-1.24	3	7.24	9	7.24	3

a. Determine the interval(s) where f is increasing.

b. Determine the interval(s) where f is decreasing.

c. Are there any extrema on the interval $0 \le \theta \le \dfrac{7\pi}{4}$? Explain how you know.

d. Determine the interval(s) where distance between $f(\theta)$ and the pole is increasing on $0 \le \theta \le 2\pi$? Justify your work.

e. Determine the interval(s) where distance between $f(\theta)$ and the pole is decreasing on $0 \le \theta \le 2\pi$? Justify your work.

f. Find the average rate of change of f between $\theta = \pi$ and $\theta = \dfrac{5\pi}{4}$.

g. Estimate the value of $f\left(\dfrac{\pi}{3}\right)$ using an average rate of change.

2. $r = f(\theta) = 8\sin(2\theta)$

   a. Is f increasing or decreasing on the interval $0 \le \theta \le \frac{\pi}{4}$?

   b. Is the distance between $f(\theta)$ and the pole is increasing or decreasing on the interval $0 \le \theta \le \frac{\pi}{4}$?

θ	r
0	
$\dfrac{\pi}{6}$	
$\dfrac{\pi}{4}$	

   c. Find the average rate of change of f between $\theta = \frac{\pi}{6}$ and $\theta = \frac{\pi}{4}$.

   d. Estimate the value of $f\left(\frac{\pi}{6}\right)$ using an average rate of change.

Answers to 3.15 CA #1

1.

  a. $\left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$

  b. $\left(0, \frac{\pi}{2}\right)$ and $\left(\frac{3\pi}{2}, 2\pi\right)$

  c. at least 2 extrema: changes from decreasing to increasing to decreasing

  d. $\left(\pi, \frac{3\pi}{2}\right)$ r is positive and increasing

    $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$ r is negative and decreasing

  e. $\left(\frac{3\pi}{2}, 2\pi\right)$ r is positive and decreasing

    $\left(\frac{\pi}{2}, \frac{3\pi}{4}\right)$ r is negative and increasing

  f. $\frac{16.96}{\pi} \approx 5.398$ units per radian

  g. $y + 3 = -2.24\left(x - \frac{\pi}{2}\right)$

    $f\left(\frac{\pi}{3}\right) \approx -1.827$

2.

θ	r
0	0
$\dfrac{\pi}{6}$	6.928
$\dfrac{\pi}{4}$	8

  a. increasing

  b. increasing: r is positive and increasing

  c. $\frac{-12.864}{-\pi} \approx 4.09$ units per radian

  d. $y - 0 = 10.18(x - 0)$

    $f\left(\frac{\pi}{6}\right) \approx 5.33$