

APPC Lesson 8.5 Homework

Name _____

1. Consider the graph of $f(\theta) = 5 \cos 3\theta$ for $0 \leq \theta \leq 2\pi$. At which value(s) of θ does f have a relative maximum? How do you know?

2. Find the average rate of change of the polar function $g(\theta) = 3 + 5 \sin(2\theta)$ on the interval $\left[\frac{3\pi}{4}, \pi\right]$. Show your calculation.

3. A polar function $r = g(\theta)$ has an average rate of change of $\frac{-4}{\pi}$ on an interval $[\theta_1, \theta_2]$. Interpret the meaning of this average rate of change.

4. Consider the graph of $f(\theta) = 5 \cos 3\theta$ for $0 \leq \theta \leq 2\pi$.
 - a. What is the relative maximum of f ?

 - b. What is the relative minimum of f ?

 - c. What do these points have in common?



5. Let $r = f(\theta)$ be a polar function with $f(\theta) = 2\theta + 6\cos(2\theta)$. On which of the following intervals does f have a positive average rate of change?

A) $-\frac{\pi}{2} < \theta < 0$

B) $0 < \theta < \frac{\pi}{4}$

C) $\frac{\pi}{4} < \theta < \frac{\pi}{2}$

D) All of the above

6. Consider the function $r = f(\theta)$ where $f(\theta) = 3 + 6 \cos \theta$.

a. Complete the table to identify if the outputs of f are positive or negative on the interval, and if f is increasing or decreasing on each interval.

Interval	$f(\theta) > 0$ or $f(\theta) < 0$	f is increasing or f is decreasing
$0 < \theta < \frac{\pi}{3}$		
$\frac{\pi}{3} < \theta < \frac{\pi}{2}$		
$\frac{\pi}{2} < \theta < \frac{2\pi}{3}$		
$\frac{2\pi}{3} < \theta < \pi$		
$\pi < \theta < \frac{4\pi}{3}$		

b. For each of the given intervals in the table, determine if the distance between $f(\theta)$ and the pole is increasing or decreasing.

c. What is occurring on the graph of f when $f(\theta)$ changes signs?

d. What is occurring on the graph of f when f changes from increasing to decreasing or decreasing to increasing?

7.

A table of selected values is given for a polar function $r = f(\theta)$. The selected values correspond to all the relative extrema of f on the domain of the polar function.

θ	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π
$f(\theta)$	4	-2	1	-5

- a. What is the maximum distance between a point on the graph of f , $(f(\theta), \theta)$, and the pole? How do you know?
- b. Determine if f has a relative maximum or a relative minimum at $\theta = \frac{\pi}{3}$ or explain why this cannot be determined.

8. Let $f(\theta) = 3 \cos \theta + 1$.
- a. Find $f(0)$, $f\left(\frac{\pi}{3}\right)$, $f\left(\frac{2\pi}{3}\right)$, and $f(\pi)$.
- b. Without doing any calculations use the values you found in part a to find a lower and upper bound for $f\left(\frac{\pi}{7}\right)$. Write your answer in the form _____ $< f\left(\frac{\pi}{7}\right) <$ _____.
- c. Does f change at a constant rate? In other words, does each equal interval of θ produce an equal change in $f(\theta)$?
- d. Find the average rate of change of f on the interval $[0, \pi]$.
- e. If f changed at the constant rate at the value calculated in part d, what would the change in f be over an interval of $\frac{\pi}{7}$ radians?
- f. Estimate $f\left(\frac{\pi}{7}\right)$ using your work in part e.
- g. Does your estimate make sense based on your work in part b?