

Name _____

Class block _____

March 21, 2003

Part A (35%) _____
Part B (40%) _____
Part C (25%) _____
overall _____

Write complete, fully explained solutions. If you use your calculator for a significant step, tell what you did on the calculator.

$\text{cis } \theta$ is an abbreviation for $(\cos \theta + i \sin \theta)$.

Part A. Polar coordinates and graphing

1. Answer the following questions about the polar equation $r = 3 + 8 \cos(5\theta)$.

a. Sketch a polar graph of the equation.
 (Use your calculator. To get a good view, press **ZOOM** **ZStandard** **ZOOM** **ZSquare**.)

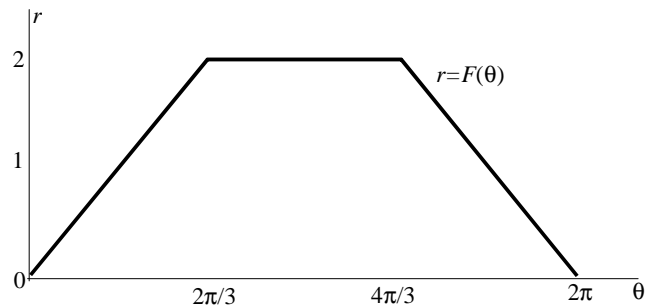
b. Find the range of possible r -values for this equation.

c. What are the lengths of all the “leaves” in this polar graph?

2. The given graph shows a function $r = F(\theta)$, graphed in a rectangular format (not a polar graph).

a. Fill in the table below with data points taken from the given graph.

θ	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
r							



b. Sketch a polar graph of $r = F(\theta)$.

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3. Write any polar equation whose graph fits each of the following descriptions.

No explanation or justification is required.

a. a circle

b. a straight line

c. a spiral (of any kind)

Part B. Complex numbers in polar form

1. Let $z = 2 - 2i$ and $w = \text{cis}(2\pi/3) = \cos(2\pi/3) + i \sin(2\pi/3)$.

a. Calculate zw by multiplying two complex numbers in rectangular form.
Leave your answer in rectangular form.

b. Calculate zw by multiplying two complex numbers in polar form.
Leave your answer in polar form.

c. Show that your answers to parts **a** and **b** agree with each other.

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2. Let $z = \sqrt{3} + i$. Perform the following calculations. You may express your answers in either rectangular form or polar form.

a. Calculate z^{10} .

b. Calculate $\frac{1}{z}$.

3. Calculate all the cube roots of -125 . Leave your answers in polar form. Then, draw a graph showing all of your answers in the complex plane.

