

Name \_\_\_\_\_

Honors Pre-Calculus Test

Block (please circle) D G

Chapter 6

March 11, 2002

page 1

Part A (20%)	_____
Part B (25%)	_____
Part C (30%)	_____
Part D (25%)	_____
overall	_____

**General instructions:** Show your work throughout. Unless specified, you may do calculations in either rectangular or polar form, and leave answers as either  $a + bi$  or  $r(\cos \theta + i \sin \theta)$ .

### Part A. Graphs of polar equations

1. Write a polar equation whose graph is a 6-leaved rose. No explanation is required.
2. Using your calculator, find the smallest possible interval of  $\theta$  values that produces the complete graph of the polar equation  $r = \cos \frac{\theta}{2}$ . Name the interval. Also, sketch the graph.
3. Convert the polar equation  $r = 2 \sec \theta$  to a rectangular equation. Then, sketch the graph and verbally describe the graph.



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Honors Pre-Calculus Test

Chapter 6

page 3

### Part C. Powers and roots of complex numbers

1. Let  $w = \frac{1}{2} + \frac{\sqrt{3}}{2}i$ .

a. Calculate  $w^8$ .

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

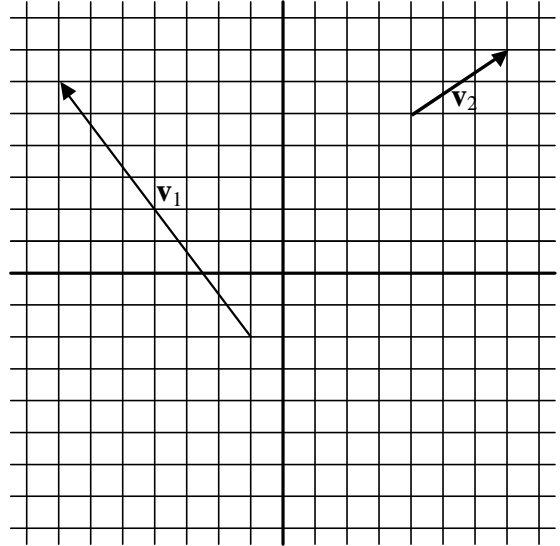
2. Let  $z = 32(\cos \pi + i \sin \pi)$ . Calculate all the 5th roots of  $z$ . Leave your answers in polar form. Then, draw a graph showing all of your answers in the plane.

**Part D. Vectors and parametric equations**

Question 1 counts as 15% of the test;  
question 2 counts as 10% of the test.

1. Vectors  $\mathbf{v}_1$  and  $\mathbf{v}_2$  are given on the grid.

a. Are  $\mathbf{v}_1$  and  $\mathbf{v}_2$  perpendicular? Perform a vector computation that proves your answer.



b. On the grid, draw the vector  $\frac{1}{2}\mathbf{v}_1 - \mathbf{v}_2$ .

c. Perform a calculation of  $\frac{1}{2}\mathbf{v}_1 - \mathbf{v}_2$ . Check that your answer agrees with what you drew in part b.

2. Given the parametric equations  $x = e^t$  and  $y = \ln t$ , eliminate the parameter  $t$  to obtain a rectangular equation. Then, sketch the graph.