

# Math 130 - Quiz 10

November 13, 2019

Name key

Score \_\_\_\_\_

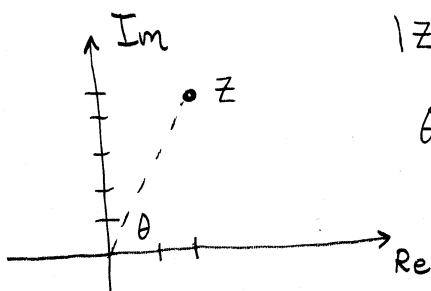
Show all work to receive full credit. Supply explanations when necessary. This quiz is due November 18.

1. (2 points) Compute the value of  $\left[ 2 \left( \cos \frac{\pi}{8} + i \sin \frac{\pi}{8} \right) \right]^6$ . Write your final result in standard form.

$$z^6 = 2^6 \left[ \cos \frac{6\pi}{8} + i \sin \frac{6\pi}{8} \right]$$

$$= 64 \left( -\frac{\sqrt{2}}{2} + i \frac{\sqrt{2}}{2} \right) = -32\sqrt{2} + 32\sqrt{2}i$$

2. (4 points) Let  $z = 2 + 5i$ . Write  $z$  in polar form, and then use DeMoivre's theorem to compute  $z^4$ . Write your final result in standard form.



$$|z| = \sqrt{2^2 + 5^2} = \sqrt{29}$$

$$\theta = \tan^{-1}\left(\frac{5}{2}\right)$$

$$z = \sqrt{29} (\cos \theta + i \sin \theta)$$

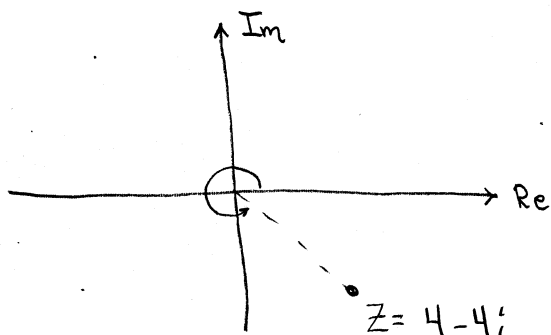
WHERE  $\theta = \tan^{-1}\left(\frac{5}{2}\right)$

$$z^4 = (\sqrt{29})^4 (\cos 4\theta + i \sin 4\theta)$$

$$= 841 \left( \cos \left( 4 \cdot \tan^{-1}\left(\frac{5}{2}\right) \right) + i \sin \left( 4 \cdot \tan^{-1}\left(\frac{5}{2}\right) \right) \right)$$

$$= 41 - 840i$$

3. (4 points) Find the five 5th roots of  $4 - 4i$ .



$$|z| = \sqrt{4^2 + (-4)^2} = \sqrt{32}$$

$$\frac{315^\circ}{5} = 63^\circ, \quad \frac{360^\circ}{5} = 72^\circ$$

$$\theta = 315^\circ$$

$$z = 4 - 4i$$

$$= \sqrt{32} (\cos 315^\circ + i \sin 315^\circ)$$

$$z_1 = 32^{1/5} (\cos 63^\circ + i \sin 63^\circ)$$

$$z_2 = 32^{1/5} (\cos 135^\circ + i \sin 135^\circ)$$

$$z_3 = 32^{1/5} (\cos 207^\circ + i \sin 207^\circ)$$

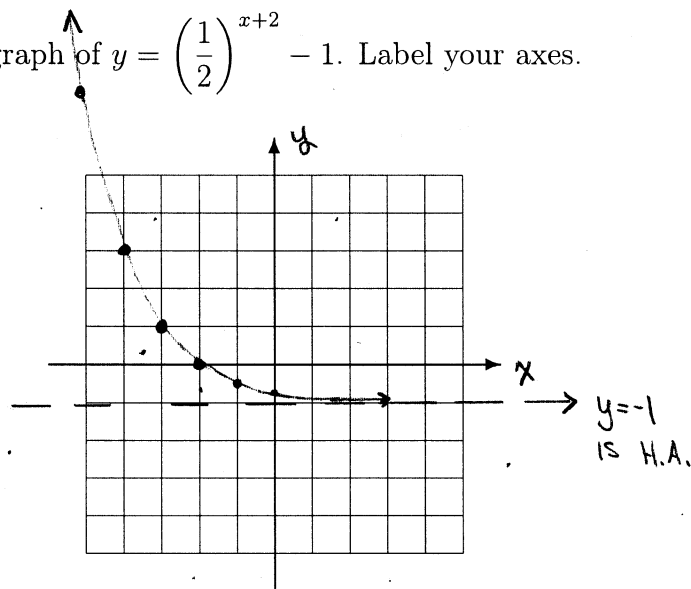
Turn over.

$$z_4 = 32^{1/5} (\cos 279^\circ + i \sin 279^\circ)$$

$$z_5 = 32^{1/5} (\cos 351^\circ + i \sin 351^\circ)$$

4. (2 points) Sketch the graph of  $y = \left(\frac{1}{2}\right)^{x+2} - 1$ . Label your axes.

x	y
-2	0
-3	1
-4	3
-5	7
-1	$-\frac{1}{2}$
0	$-\frac{3}{4}$



GRAPH OF  $y = \left(\frac{1}{2}\right)^x$   
 SHIFTED  
 2 UNITS LEFT  
 &  
 1 UNIT DOWN

5. (3 points) Solve for  $x$ .

(a)  $2^{x-2} = 64 = 2^6$

$$x-2 = 6 \Rightarrow \boxed{x = 8}$$

(b)  $5^{2x+1} = \frac{1}{125} = 5^{-3}$

$$2x+1 = -3$$

$$\boxed{x = -2}$$