

Math 830 ABSTRACT ALGEBRA

QUIZ – I

August 21 (Mon), 2006

Instructor: Yasuyuki Kachi

Line #: 17014.

ID: _____

Name: _____

[I] (2pts) (1) $(a + \sqrt{-1} b) (c + \sqrt{-1} d)$
 $= \left(\boxed{} \right) + \sqrt{-1} \left(\boxed{} \right)$
 $(a, b, c, d \in \mathbb{R}).$

(2) $(1 + \sqrt{-1} \sqrt{3}) (\sqrt{3} + \sqrt{-1}) =$ _____.

[II] (2pts) (1) $(a + \sqrt{-1} b)^{-1}$
 $= \left(\frac{\boxed{}}{\boxed{}} \right) + \sqrt{-1} \left(\frac{\boxed{}}{\boxed{}} \right)$
 $(a, b, \in \mathbb{R}, a \neq 0 \text{ or } b \neq 0).$

(2) $(3 + \sqrt{-1} \cdot 4)^{-1} =$
_____.

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[III] (3pts) Find the absolute values:

(1) $|\sqrt{-2}| =$ _____ . (2) $|3 - 4\sqrt{-1}| =$ _____ .

(3) $|\exp(\sqrt{-1}\theta)| =$ _____ (where $\theta \in \mathbb{R}$).

[IV] (3pts) Find the conjugates:

(1) $\overline{\sqrt{-2}} =$ _____ . (2) $\overline{3 - 4\sqrt{-1}} =$ _____ .

(3) $\overline{\exp(\sqrt{-1}\theta)} =$ _____ (where $\theta \in \mathbb{R}$).

[V] (2pts)

(1) $\exp\left(\frac{\pi\sqrt{-1}}{8}\right) \cdot \exp\left(\frac{\pi\sqrt{-1}}{24}\right) =$ _____ .

(2) $\left(\exp\left(\frac{6\pi\sqrt{-1}}{7}\right)\right)^{-1} =$ _____ .

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[VI] (2pts) (1) $\frac{-1 + \sqrt{-1}}{\sqrt{2}} = \exp\left(\sqrt{-1} \frac{\boxed{}}{\boxed{}}\right).$

(2) $\sqrt{-1} e = \exp\left(\boxed{} + \sqrt{-1} \frac{\boxed{}}{\boxed{}}\right).$

[VII] (6pts) Solve the equations.

(1) $z^2 = \exp\left(\frac{\pi \sqrt{-1}}{16}\right).$

$z =$

_____, _____.

(2) $z^4 = 1.$

$z =$

_____, _____, _____, _____.

(3) $z^4 + z^3 + z^2 + z + 1 = 0.$

$z =$

_____, _____,

_____, _____.