

**Midterm Examination 1 Review**

**MTH 13 Section E01**

**Exam Date: 21 February 2017**

1. The vector  $\vec{A}$  of length 10 is in the fourth-quadrant. The angle between  $\vec{A}$  and the  $x$ -axis is  $60^\circ$ . Resolve the vector  $\vec{A}$  (i.e. write  $\mathbf{A}$  into the sum  $\vec{A}_x + \vec{A}_y$ ).
2. B's car is in mud. B, his wife, and their two children are trying to pull the car from it. B is applying 10 Newton of force to the East, and his wife 10 Newton to the North. Each children is pulling the car in  $5\sqrt{2}$  Newton of force to the Southeast. What is the total force applied to the car?
3. Add two vectors  $\vec{A}$  and  $\vec{B}$  where the lengths of these vectors are  $A = 4$  and  $B = 3$ . The angles in standard position of these vectors are  $0^\circ$  and  $90^\circ$ , respectively. Give your answer in "length  $\angle$  angle" form. You may use  $36.87^\circ = \tan^{-1}\left(\frac{3}{4}\right)$ .
4. Add three vectors  $\vec{A}$ ,  $\vec{B}$ , and  $\vec{C}$  where the lengths of these vectors are  $A = 1$ ,  $B = 2$ , and  $C = 3$ . The angles in standard position of these vectors are  $45^\circ$ ,  $180^\circ$ , and  $330^\circ$ , respectively. Give your answer in "length  $\angle$  angle" form.
5. Find values of  $x$  and  $y$  that satisfies the following equation:  $2x - 6xi^3 - 3i^2 = yi - y + 7i^5$ .
6. Express the following expression in the form of  $a + bi$ .
$$\frac{4i}{1-i} - \frac{8+i}{2+3i}$$
7. Subtract  $4 - 2i$  from  $2 - 3i$  graphically.
8. Write  $-3 + 4i$  in polar form. You may use  $53.13^\circ = \tan^{-1}\left(\frac{4}{3}\right)$ .
9. Express  $\frac{\sqrt{3}}{2} + \frac{1}{2}i$  in exponential form.
10. Find all three roots of  $z^3 = i$ , where  $z$  is a complex variable.