Midterm Examination 1
MTH 13 Section E01
21 February 2017 18:00–19:50

Instructions: Please answer the following and be sure to show your work or support your answer. You are not allowed to use the textbook, workbook, or notes. You cannot talk to other sudents. You can use your calculator.

1. The vector $\overrightarrow{A}$ of length 10 is in the second-quadrant. The angle between $\overrightarrow{A}$ and the y-axis is $30°$. Resolve the vector $\overrightarrow{A}$ (i.e. write $\overrightarrow{A}$ into the sum $\overrightarrow{A}_x + \overrightarrow{A}_y$).

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 100 Newton of force to the East, and his wife 100 Newton to the North. Each children is pulling the car in $50\sqrt{2}$ Newton of force to the Southeast. What is the total force applied to the car?

3. Add two vectors $\overrightarrow{A}$ an $\overrightarrow{B}$ where the lengths of these vectors are $A = 3$ and $B = 4$. The angles in standard position of these vectors are $0°$ and $90°$, respectively. Give your answer in "length $\angle$ angle" form. You may use $53.13° = \tan^{-1}\left(\frac{4}{3}\right)$.

4. Add three vectors $\overrightarrow{A}$, $\overrightarrow{B}$, and $\overrightarrow{C}$ where the lengths of these vectors are $A = 10$, $B = 20$, and $C = 30$. The angles in standard position of these vectors are $0°, 120°$, and $225°$, respectively. Give your answer in "length $\angle$ angle" form. You may use $\tan^{-1}\left(1 - \sqrt{\frac{2}{3}}\right) = 10.4°$ and $\sqrt{12 - 3\sqrt{6}} = 2.156$.

5. Find values of x and y that satisfies the following equation: $9 - i = xi + 1 - y$.

6. Express the following expression in the form of $a + bi$.

$$\frac{i}{1+i} - \frac{8-i}{2+i}$$

7. Subtract $1 + 3i$ from $1 - 3i$ graphically.

8. Write $-4 + 3i$ in polar form. You may use $36.87^\circ = \tan^{-1}\left(\frac{3}{4}\right)$.

9. Express $\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$ in exponential form.

10. Find all three roots of $z^3 = 1$, where z is a complex variable.