Work through the following problems and have your tutor sign your solutions and record your name before the end of your Week 4 tutorial. You are encouraged to discuss these questions and your solutions with your peers and to ask your tutor for assistance. Working through ten sets of tutorial problems is compulsory and each of the ten problem sets will contribute 1% towards your final grade. Note that you earn the 1% for your effort in solving these problems during the tutorial rather than for answering all the problems correctly.

Once you have finished these problems, you can use the remainder of your tutorial time to work on other aspects of the course. Solutions to the tutorial problems will be distributed next week.

1. Use radians throughout this question.
For parts a) and b) give exact answers (not decimal approximations).
For parts c) and d) give decimal approximations to 2 decimal place accuracy.

   a) The vector \( \mathbf{a} \) has magnitude 5 and direction \( \frac{7\pi}{6} \) radians. Write \( \mathbf{a} \) in component form.

   b) Find the magnitude and direction of the vector \( \mathbf{b} = -2i \).

   c) The vector \( \mathbf{c} \) has magnitude 2 and direction 2.15 radians. Write \( \mathbf{c} \) in component form.

   d) Find the magnitude and direction of the vector \( \mathbf{d} = -3i + j \).

2. Use the trigonometric identity TI16 to determine the exact value of \( \cos\left(\frac{7\pi}{8}\right) \).

3. Let \( ABCD \) be a rectangle with \( P \) the midpoint of the line segment \( AC \) as shown.
Let \( \mathbf{AD} = \mathbf{u} \) and let \( \mathbf{AB} = \mathbf{v} \).

   a) Express \( \mathbf{AP} \) in terms of \( \mathbf{u} \) and \( \mathbf{v} \).

   b) Express \( \mathbf{BP} \) in terms of \( \mathbf{u} \) and \( \mathbf{v} \).

   c) Express \( \mathbf{PD} \) in terms of \( \mathbf{u} \) and \( \mathbf{v} \).

   d) Use the above calculations to show that the diagonals of a rectangle bisect each other.