Work through the following problems and have your tutor check your solutions and record your name before the end of your Week 9 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 0.5% towards your final grade. Note that you earn the 0.5% 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.

Make sure you have finished last week's questions.

1. The evil Harry McBarry has tied Luscious Lisa to the railway track. The 9.52am express train is racing towards Lisa along the line $y = 3x - 2$. Lisa's boyfriend, Marvin McMathman, is at the point $(2, 7)$, sitting on his moose.

   (a) Marvin must ride in a straight line towards the railway track and cross the track at the point $(1, 1)$ in front of that train, forcing it to stop before it strikes Lisa. What is the equation of the straight line marking Marvin's ride?

   (b) Unfortunately Marvin is a twit (Lisa does not love him for his mind, nor for his love of moose). He has no sense of direction so needs help from Charlie the wonder dog. Charlie starts at the point $(2, 5)$ and travels towards the railway track on a line parallel to Marvin's. At what point will Charlie cross the railway track? (Hint: you'll need the equations for each of the train, Marvin and Charlie.)

2. (a) Determine the equation of the circle centered at the origin having radius 4.

   (b) Use your equation to show that the point $(2\sqrt{2}, 2\sqrt{2})$ lies on this circle.

   (c) The point $(x, \sqrt{7})$ lies on this circle. Determine all the possible values for x.

3. Before Damien can marry Celeste, he must prove to her father that he can save the deposit for a house. He has \$600 to invest, his account pays 6.0 percent interest per annum, compounding continuously, and he needs to have a total of \$1740 before he can get married. He is currently 19 years old. At what age can he get married? (Hint: $y = e^x \Rightarrow x = \ln y$.)

4. Without using a calculator, find each of:

   (a) $\log_{15} 15^{13}$

   (b) $\log_4 4$

   (c) $\log_5 \dfrac{1}{5}$

   (d) $\log_{10} 10000$

   (e) $\log_{10} \dfrac{1}{10}$

   (f) $\ln e$

   (g) $\ln \dfrac{1}{e^{19}}$

   (h) $\log_{16} 4$