

All questions should be submitted by 4pm on Friday May 27th. Assignments can be submitted at your tutorial, or to the MATH1040/7040 assignment boxes (4th floor Priestley Building #67). **Make sure that your name, student number, tutorial group and your tutor's name are on each sheet of your answers.** You do not need a cover sheet nor do you need to include the question sheet. Solutions will be distributed in class later.

1. In his last motorcycle race, world motor cycle champion Ted "Leadfoot" McGrath was riding around a racing track. He approached a corner, in which the track satisfies the equation $y = x^2 - 4x - 12$. Unfortunately, when he reached the point $(5, -7)$ his bike completely failed to grip the road. Ted and his bike slid off the road, tangentially to their original direction of travel.
 - (a) Find the equation of the line which Ted followed after his bike slid off the road.
 - (b) Between the stadium and the track there was a straight wall, with equation $y = -7x + 15$. Find the x and y coordinates of the point at which Ted hit the wall?
2. Damien and Celeste are standing together in the school yard, when Damien suddenly says "I am going to kiss you". Unfortunately, he is a hideous boy, who probably will be a mathematician when he grows up. To preserve her maidenly virtues, Celeste runs directly away from him. In the throes of rampant hormones, Damien runs directly after her. At any time $t \in [0, 12]$, her displacement is given by $S_1 = -0.5t^2 + 12t$, and his displacement is given by $S_2 = 0.7t^2$.
 - (a) Give an equation for the distance D **between** them at any time t .
 - (b) At what time is the distance between them a maximum?
 - (c) Assume Damien is short-sighted, and will lose sight of Celeste if she gets more than 35m away from him. Is she safe? (Hint: find the maximum distance between them.)
 - (d) What is Celeste's velocity at any time t ? What is Damien's velocity at any time t ?
 - (e) In (c), we looked at the maximum distance between Damien and Celeste. What would you expect their velocities to be in comparison with each other at the exact time when the distance between them is at a maximum? Why? Verify this using your results from Part (d).
 - (f) At what time does he catch her? Explain why you obtained two answers.
3. How have you found this course? Is it easier or harder than you expected? How do you think you'll go in the final exam? Are you contemplating doing more mathematics courses? Write at least 10 lines.