

*This midterm has **4 questions** on **6 pages**, for a total of 35 points.*

Duration: 50 minutes

- Read all the questions carefully before starting to work.
- Give complete arguments and explanations for all your calculations; answers without justifications will not be marked.
- Continue on the back of the previous page if you run out of space.
- Attempt to answer all questions for partial credit.
- This is a closed-book examination. **None of the following are allowed:** documents, cheat sheets or electronic devices of any kind (including calculators, cell phones, etc.)
- Don't think about pink elephants.
- Does anyone read these things?

Full Name (including all middle names): _____

Student-No: _____

Signature: _____

Question:	1	2	3	4	Total
Points:	15	6	6	8	35
Score:					

SHORT ANSWER QUESTIONS.

Please show your work and also underline your answer.

Each question is worth 3 marks, but an incorrect answer will be given at most 1 mark.

Unless otherwise stated, it is not necessary to simplify your answers.

3 marks 1. (a) Let $y = \tan(\arccos(x))$. What is $\frac{dy}{dx}$? (remember arccos is inverse-cosine).

3 marks (b) What is $\lim_{x \rightarrow +\infty} \frac{x+2}{\sqrt{4x^2+x}}$?

3 marks (c) Use a linear approximation to estimate $\sqrt{3.9}$.

3 marks

(d) Find the derivative of the following function

$$g(t) = \frac{(1+t)^{3/2}(2-\cos(t))^7}{(1+e^t)^{2/5}}.$$

3 marks

(e) If $x^3 - y^3 = e^y$ what is $\frac{dy}{dx}$?

FULL-SOLUTION PROBLEMS

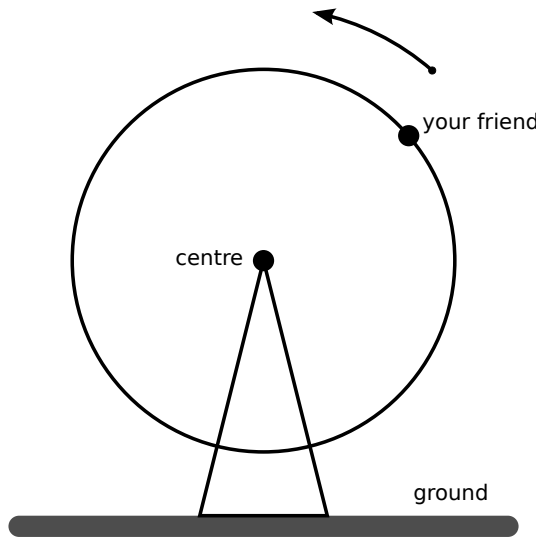
In questions 2–4, justify your answers and **show all your work**. If you need more space, use the back of the *previous* page.

6 marks

2. A 1kg lump of unknown material is decaying radioactively. After 20 minutes 100g has decayed.
- (a) What is the half-life of the material?
 - (b) How long until only 250g remain?

6 marks

3. Your friend is riding a big circular Ferris wheel with radius 30m. It completes one rotation every 5 minutes. How fast is your friend rising when they are 18m higher than the centre of the wheel? Include units in your answer.



8 marks

4. Consider the function $f(x) = e^x \sin(x)$.

- (a) Write down the 3rd degree Maclaurin polynomial for f and so approximate $f(1/2)$.
- (b) Estimate the error in this approximation.