

All questions should be submitted by 4pm on Friday May 20th. 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. Find y' where $y = -6x^2 - 7$

2. Find y' where $y = -7x + 4x^6 + \frac{3}{x^4}$

3. Find y' where $y = 2 \sin x - 5 \cos x$

4. Find y' where $y = -4 \ln x - 7e^x + x^8$

5. Let $f(x) = -x^3 - 9x^2 - 24x$.

Q1 Find $f'(x)$.

Q2 Solve $f'(x) = 0$.

Q3 Find $f''(x)$.

Q4 Find $f'(-4)$.

6. Let $y = (5 - 8x)(2x^2 + 2)$. Find y' using the product rule.

7. If $y = \frac{-5x^2 + 5}{4x^2 + 5x}$, find y' .

8. If $y = \frac{2z + 8}{-8 - 7z}$, find y' .

9. The public is bored with traditional Olympic sports. In an effort to improve the broad general appeal of the London Olympics, it has been decided to introduce a new sport: nude stunt pig riding. Contestants have to try to ride their pigs on a difficult course, shaped much like a roller-coaster track, without falling off. Pablo is a member of the Puerto Rican pig riding team.

(a) The first stage of competition involves riding on a track which matches the equation $y = x^2 - 2x + 6$, where x represents horizontal distances in metres, and y represents the height of the track, in metres.

(i) Find the slope of the track at any point (that is, find the derivative of y).

(ii) Pablo will fall off his pig if the track has a slope equal to 8 or -4 . Find the x -coordinates of the points at which this happens.

(iii) Find the y -coordinates of the points in Part (ii).

(iv) Pablo remarks that nude pig riding is quite enjoyable, **except** for some discomfort where the pig is exactly level (because at that point the slope is changing from a negative slope to a positive slope, or positive to negative, and the changeover hurts!). At what value of x is Pablo's pig exactly level?

(continued over...)

- (b) The second stage of competition involves a much harder course, which matches the equation $y = \frac{1}{3}x^3 + x^2 - 24x + 4$.
- (i) Find out where Pablo and his pig are exactly level?
 - (ii) Alas! There is controversy over the uniform in this sport! Pablo cheats and attaches a small piece of velcro to himself and his pig. Now he can stay on until the track has slope 11. At what values of x does the track have this slope?