

MA1M01 Calculus Assignment 6

Michaelmas term week 9

www.maths.tcd.ie/pub/MA1M01/Calculus/

1. **[20 points]** Use the product rule to determine the derivatives of both of the following:

(a) $y = x^2 \sin(3x)$

(b) $y = \frac{3x \cos(7x^3 - x)}{8}$

(c) $y = 6x(9x - 3)^3$

(d) $y = (2x^2 - 7)^4(3x^4 - 1)^2$

2. **[20 points]** The time of sunset over the course of the year can be approximated by $s(t)$

$$s(t) = 19 : 30 - 2 : 30 \cos\left(\frac{2\pi t}{365}\right)$$

where t represents time in days, starting from $t = 0$ on January 1st.

- (a) Graph this function over a one year period $t \in [0, 365]$
- (b) What is the time of sunset on January 12th? (be careful converting time to decimal and back again).
3. **[40 points]** Integrate each of the following, using substitution where appropriate.

(a) $\int \cos(6x) \, dx$

(b) $\int 4x \sin(9x^2) \, dx$

(c) $\int \sin(x) \cos(x) \, dx$

(d) $\int \frac{3}{x^3} \left(\frac{7}{9x^2}\right)^{\frac{3}{2}} \, dx$

4. **[20 points]** Use the quotient rule to evaluate the derivative of $y = \frac{\cos(x)}{\sin^2(x)}$

Homework is due one week from when it is given in the tutorial you are assigned to. This set should be handed up in week 10.