

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) **[5 points]** $2x \sin(3x) + 3x^2 \cos(3x)$

(b) **[5 points]** $\frac{3}{8} (\cos(7x^3 - x) - x(21x^2 - 1) \sin(7x^3 - x))$

(c) **[5 points]** $6(9x - 3)^3 + 162x(9x - 3)^2$

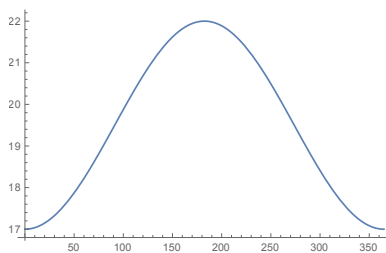
(d) **[5 points]** $16x(2x^2 - 7)^3(3x^4 - 1)^2 + 24x^3(3x^4 - 1)(2x^2 - 7)^4$

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) **[10 points]**



- (b) **[10 points]** $s(11) = 17 : 03$

3. **[40 points]** Integrate each of the following, using substitution where appropriate.

(a) **[10 points]** $\frac{1}{6} \sin(6x) + c$

(b) **[10 points]** $\frac{-2}{9} \cos(9x^2) + c$

(c) **[10 points]** $\frac{\sin^2(x)}{2} + c$

(d) [10 points] $\frac{-54}{70} \frac{1}{x^5} \left(\frac{7}{9}\right)^{\frac{5}{2}} + c \simeq \frac{-0.411}{x^5} + c$

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

$$\frac{-(1 + \cos^2(x))}{\sin^3(x)}$$

*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.*