MA1M01 Calculus Assignment 7 Michælmas term week 9

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

1. [40 points] Integrate each of the following using integration by parts:

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

(b) $\int x \cos(5x) dx$
(c) $\int xe^x dx$
(d) $\int xe^{-x} dx$

2. **[10 points]** Without using a calculator solve for *x*:

(a)
$$\ln(2x^3) - \ln(x) = \ln(16) + \ln(x)$$

(b) $\ln(2x^2) + \ln(x) = \ln(32) - \ln(x)$

3. [30 points]Differentiate each of the following with respect to x:

(a)
$$\frac{x}{\sqrt{1+\frac{x^2}{c}}}$$
 (b) e^{x^3}
(c) $\frac{e^{x^3}}{x^2}$

4. [20 points] The number of bacteria P(t) in a Petri dish is given by

$$P(t) = (210^5)e^{0.1t} \tag{1}$$

where t is the time, in hours since the bacteria were introduced to the Petri dish.

- (a) How many bacteria were introduced to the Petri dish?
- (b) How long does it take for the population to double?
- (c) What is the instantaneous rate of change of the population after 24 hours?

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.