

Homework 17

1) Use the substitution $u=2x-1$ to evaluate the integral

$$\int_1^2 \frac{2x}{(2x-1)^2} dx$$

6

2) Use integration by parts to determine

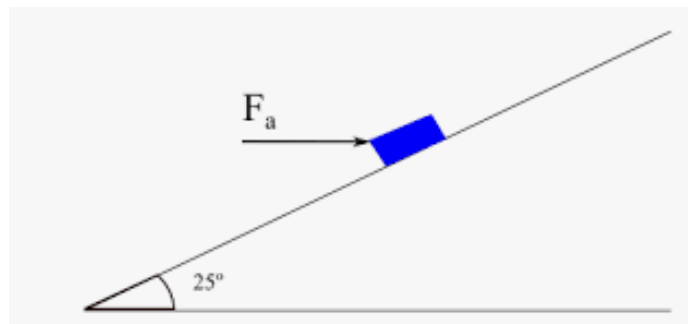
a) $\int x \cos 3x dx$

3

b) Hence determine $\int x^2 \sin 3x dx$

2

3) An object of mass 5kg is held at rest on a slope at an angle of 25° to the horizontal. The coefficient of friction between the object and the slope is 0.2.



A horizontal force of magnitude F_a is applied which causes the object to move 4 metres up the slope in a time of 3 seconds.

Determine the magnitude of this force.

7

4) Two ships P and Q are being tracked by a radar station. The positions and velocities of each are recorded at 9am.

P has a position of $(4\mathbf{i} + 3\mathbf{j})$ km and a velocity of $(3\mathbf{i} - \mathbf{j})$ kmh⁻¹

Q has a position of $(8\mathbf{i} + \mathbf{j})$ km and a velocity of $(2\mathbf{i} + 2\mathbf{j})$ kmh⁻¹

a) Determine the position of P relative to Q in terms of t. **3**

b) At what time are the ships closest, and what is the distance between them at this time? **4**