MATH6103 Differential & Integral Calculus

MATH6500 Elementary Mathematics for Engineers

Problem Sheet 5

Deadline: **Monday 16 November, 5:00**.
Hand in to **drop box 5** in the undergraduate common room (maths department, room 502).

Hand in the questions marked with an asterisk (*).

One mark will be deducted if you do not **staple your work**.

1) Find:

a) $\int 4x + 5x^4 \, dx$

* b) $\int 3x^3 - 8x^2 \, dx$

c) $\int e^x - \sin x \, dx$

d) $\int \sin(3x + 4) \, dx$ (Hint: Let $u = 3x + 4$)

e) $\int \cos(8x - 4) \, dx$ (Hint: Let $u = 8x - 4$)

f) $\int \tan x \, dx$ (Hint: Write $\tan x$ as $\frac{\sin x}{\cos x}$)

g) $\int \sin x + \sec^2 x \, dx$

* h) $\int (7x + 7)^2 \, dx$

* i) $\int_0^2 (7x + 7)^2 \, dx$

j) $\int \frac{1}{2x+1} \, dx$

k) $\int \sqrt{4x - 8} \, dx$

l) $\int_0^{\pi/2} \cos x \sqrt{\sin x} \, dx$

2) A projectile is fired vertically upwards.

Its velocity, $v(t)$, (in ms^{-1}) at time t (in s) is given by:

$$v(t) = 50 - 9.8t$$

Calculate:

* a) the time, T_0, at which the projectile's velocity is 0.

* b) the distance the projectile travels in the first 5 seconds.

* c) the highest height which the projectile reaches.

[Hints: (b) is given by $\int_0^5 v(t) \, dt$ and (c) is given by $\int_0^{T_0} v(t) \, dt$.]