

## H. W. 7

① Calculate

$$(i) \int \frac{x^2 + 3x + 9}{(x^2 + 2x + 2)^2} dx$$

$$(ii) \int \frac{x^2 + 3x + 9}{(x^2 + 3x + 2)^2} dx$$

② Solve the following differential equations:

$$(i) \frac{dy}{dx} + \sec x y = \sin 2x$$

$$(ii) \frac{dy}{dx} + \frac{y}{x} = \tan^{-1} x$$

$$(iii) \frac{dy}{dx} + (\tan x)y = \sin x .$$

③ Show that the following improper integral converges or show that it diverges:

(i)  $\int_1^{\infty} \frac{dx}{x^3}$       (ii)  $\int_1^{\infty} \frac{dx}{\sqrt{x}}$       (iii)  $\int_3^{\infty} \frac{dx}{2x-1}$

(iv)  $\int_0^{\infty} 5e^{-2x} dx$       (v)  $\int_1^{\infty} \ln x dx$

④ Compute the following integrals.

(i)  $\int x \cosh(1-x^2) dx$

(ii)  $\int_0^{\ln 2} \sinh 3x dx$

⑤ Show that

$$\int \frac{dx}{\sqrt{x^2+a^2}} = \sinh \frac{x}{a} + C$$

for constant  $a > 0$ .