$\frac{d}{dx}(uv) =$

L

I

P

E

T

1. Find the indefinite integral:

   a. $\int xe^x \, dx$

   b. $\int 2t\cos(3t) \, dt$

c. $\int x^2 e^{-x}\, dx$

e. $\int \tan^{-1} x\, dx$

d. $\int t^2 \ln t\, dt$

2. Solve the initial value problem:

a. $\frac{dy}{dx} = 2xe^{-x}$ and $y = 3$ when $x = 0$

b. $\frac{dy}{dx} = 2x\sqrt{x+2}$ and $y = 0$ when $x = -1$

c. $\frac{dz}{dx} = x^3 \ln x$ and $z = 5$ when $x = 1$

3. Use parts and solve the unknown integral:

   a. $\int (x^2 - 5x)e^x \, dx$

b. $\int e^{-x} \cos 2x \, dx$

c. $\int_{-3}^{2} e^{-2x} \sin 2x \, dx$

4. Solve the differential equation:
   a. $\frac{dy}{dx} = x^3 \cos 2x$
   b. $\frac{dy}{d\theta} = \theta \sec \theta \tan \theta$