

## EXERCISE 12E(P) PRELIMINARY EXERCISES

### INTEGRATION BY SUBSTITUTION

1. Using the substitution given, find the following indefinite integrals :

a)  $\int 2x(4x^2 + 1)^3 dx, \quad u = 4x^2 + 1$

b)  $\int xe^{x^2+3} dx, \quad u = x^2 + 3$

c)  $\int x\sqrt{x+1} dx, \quad u = x+1$

d)  $\int \frac{t}{\sqrt{1-t^2}} dt, \quad u = 1-t^2$

e)  $\int x(x^2 + 1)^{\frac{1}{3}} dx, \quad u = x^2 + 1$

2. Using the substitution given, find the following definite integrals:

a)  $\int_0^1 xe^{x^2+1} dx, \quad u = x^2 + 1$

b)  $\int_1^4 x(1+x^2)^5 dx, \quad u = 1+x^2$

c)  $\int_{\sqrt{3}}^{2\sqrt{2}} \frac{x dx}{\sqrt{x^2+1}}, \quad u = 1+x^2$

d)  $\int_{-1}^0 x(x+1)^9 dx, \quad u = x+1$

e)  $\int_0^1 \frac{x^2 dx}{4x^3+1}, \quad u = 4x^3+1$

## ANSWERS

1.

a)  $\frac{1}{16}(4x^2 + 1)^4 + C$

b)  $\frac{1}{2}e^{x^2+3} + C$

c)  $\frac{2}{5}(x+1)^{\frac{5}{2}} - \frac{2}{3}(x+1)^{\frac{3}{2}} + C$

d)  $-\sqrt{1-t^2} + C$

e)  $\frac{3}{8}(x^2 + 1)^{\frac{4}{3}} + C$

2.

a)  $\frac{1}{2}(e^2 - e)$

b) 0

c) 1

d)  $\frac{-1}{110}$

e)  $\frac{1}{12}\ln 5$