Algebra

The word "algebra" is derived from the Arabic word Al-Jabr, and this comes from the treatise written in 820 by the medieval Persian mathematician, Muhammad, ibn Musa alKhowãrizmi, entitled, in Arabic, Kitãb al-mutafi1usab gabrwa-l-uqabala, which can be translated as The Compendious Book on Calculation by Completion and Balancing. The treatise provided for the systematic solution of linear and quadratic equations.

General Mathematics 2
Laboratory Manual

$$y(t) = \int_{a}^{t} f(x)\,dx$$

Ndidiamaka M. Ozofor, PhD
G. A. M. Ikekeonwu, PhD
E. A. Ozomadu

Department of Computer Science and Mathematics
Godfrey Okoye University, Enugu

General Mathematics 2

Ndidiamaka M. Ozofor, PhD
G. A. M. Ikekeonwu, PhD
E. A. Ozomadu

Department of Computer Science/Mathematics
Godfrey OkoyeUniversity
Ugwuomu Nike, Enugu State

Graphic Illustrations by:
E. U. Madu

Printed and Bound in the Federal Republic of Nigeria

Unit **1**

Algebra

Algebra is the science of reunion and opposition or science of transposition and cancellation -Muhammad ibn Mūsā al-Khowārizmī (father of algebra), 5th century.

Algebra is the collection of letters, symbols, numbers andsigns- R'eneDescarte, 16ᵗʰ century.

Algebra involves the science of equations and expressions of like terms versus unlike terms (Cardano, 17thcentury).

The word "algebra" is derived from the Arabic word *Al-Jabr*, and this comes from the treatise written in 820 by the medieval Persian mathematician, Muhammad ibn Mūsā al-Khowārizmī, entitled, in Arabic, *Kitāb al-mu⬚ta⬚arfi⬚isāb al-ğabrwa-l-muqābala*, which can be translated as *The Compendious Book on Calculation by Completion and Balancing.* The treatise provided for the systematic solution of linear and quadratic equations.

Algebra involves the manipulations of variables and values (numbers).Numbers include 0, 1, 2, 3, ... -1, -2, -3, ... Letters, used to denote values, are English letters: a, b, c, d, e, ... z or Greek letters: α, β, η, π, Φ, η, μ, ..., λ. Basic mathematical operators include +,x, - and ÷.

Simplify the following expressions

a.	4a + 5a

b.	5x-2x+8x
c.	x -9x+4x
d.	3yx+ 2xy
e.	4r x6s
f.	8ab x 2a
g.	$\dfrac{-22xy}{2y}$
h.	11p+3q -5p – 2q
i.	3y x 3 + 6y
j.	7a x 3+5 x 2a-9a ÷3

k.	(10a -3) – (4-5a)
l.	-2a x-5b
m.	$\dfrac{7a}{5} - \dfrac{-2z}{5}$
n.	$\dfrac{6a+1}{4} + \dfrac{9-5}{4}$
o.	$\dfrac{5}{2cd} + \dfrac{4}{3de}$

Remove brackets and simplify

a.	5 + 2 (x+3)
b.	7z−5 (z-4)
c.	2a - 6 (1-2a)
d.	2(3x −y)+3(x+5y)
t,	a (a+2) + 5(a+2)

Expand the following

a.	(x + 5)(x+4)

b.	(c - 3)(c + 7)
c.	(n-6)(n+3)
d.	(3a –b)(2a+5b)
e.	$(y-3)^2$
f.	(t-5)(t+5)

Factorize the following

i.   8x −6y
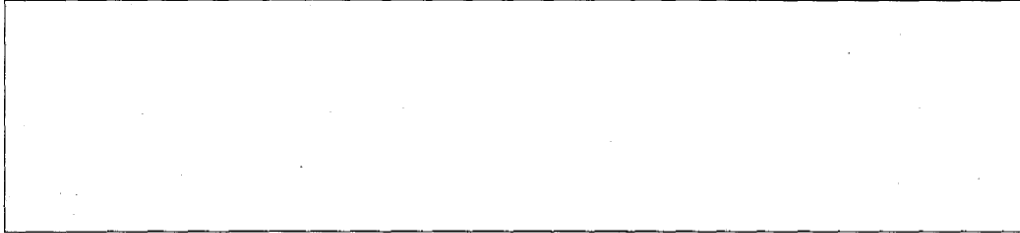
ii.   ab-ac

iii. x(3x+y)-2(3x+y)

iv. x^2 +3x+6x+18
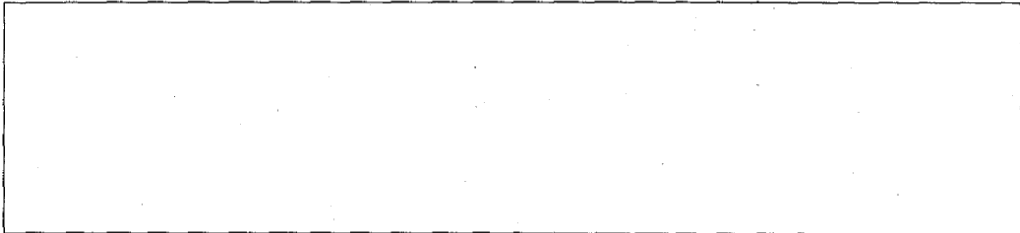
v. a^2-8a+16

vi. $y^2 + 20y + 100$
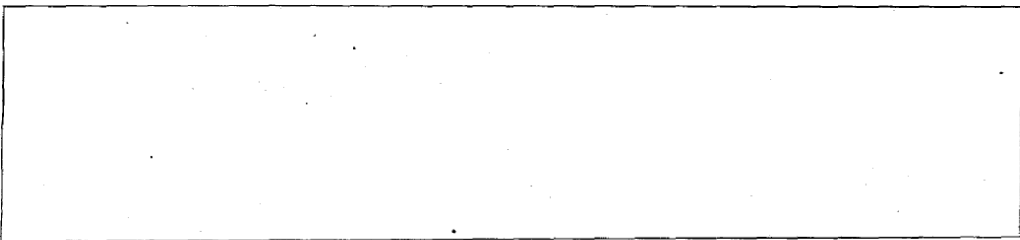
Solve the following linear equations
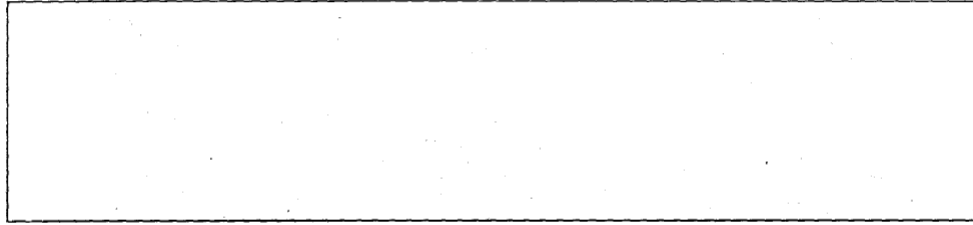
a. $9b - 4 = 14$
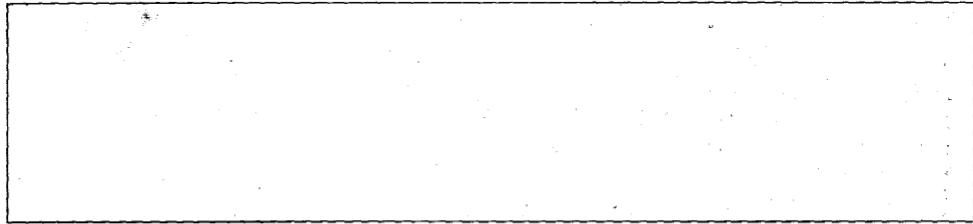
b. $1 = x - 10$
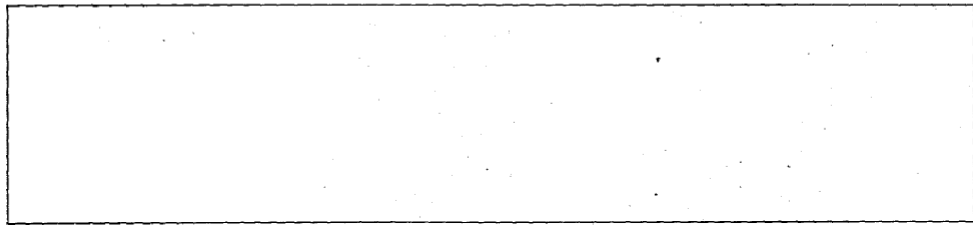
c. $8x+3 = 51$
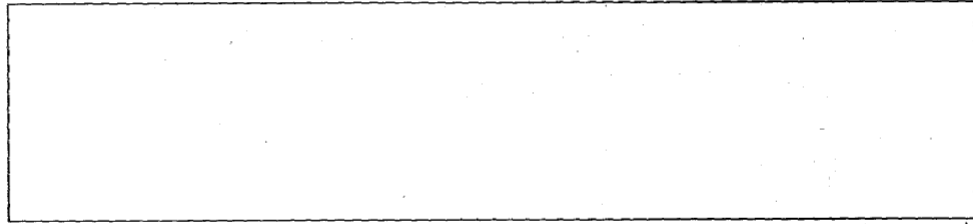
d. $19 = 5t +4$
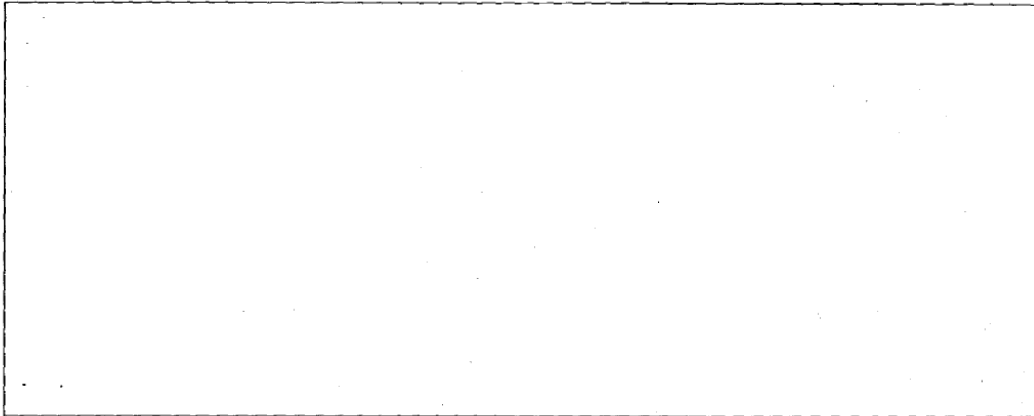
e. $3 + 14v = 38$

f. $2(x-5)=8$
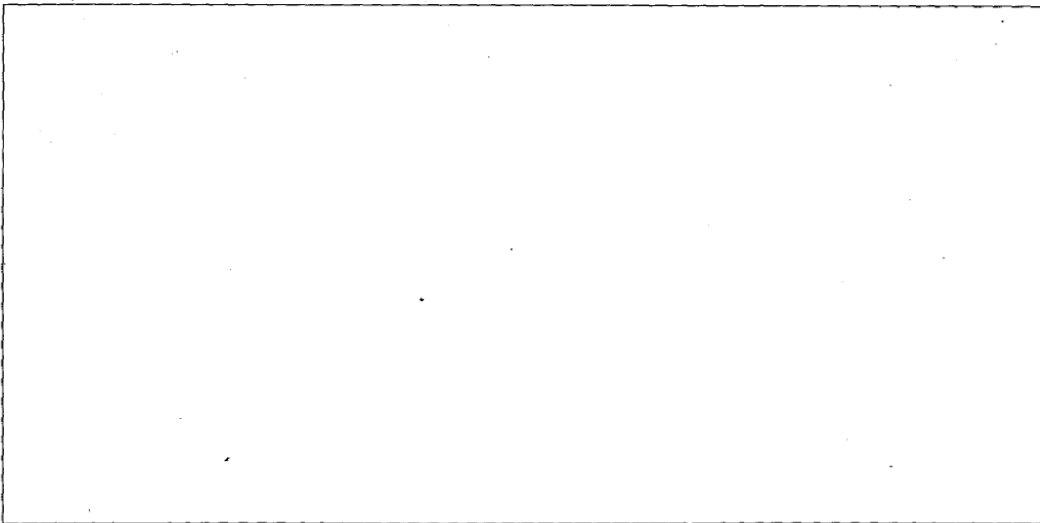
j. $\dfrac{45}{72} = \dfrac{40}{x}$

Solve the following simultaneous equations

i. $3x + y = 7$

$x + y = 5$

ii. $4a + 2y = 13$

        $3a - y = 6$
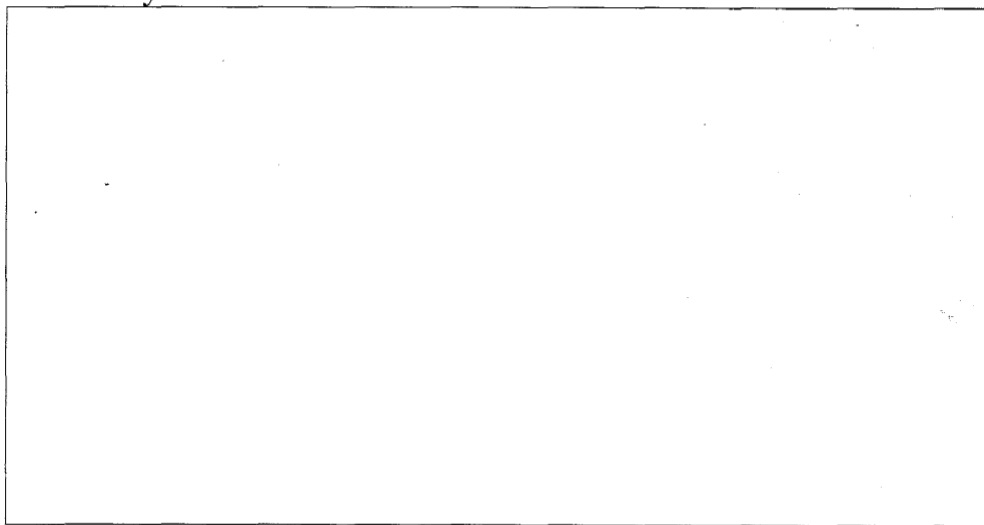
Iii $2x + 3y - 5 = 0$

        $5x - 2y + 16 = 0$
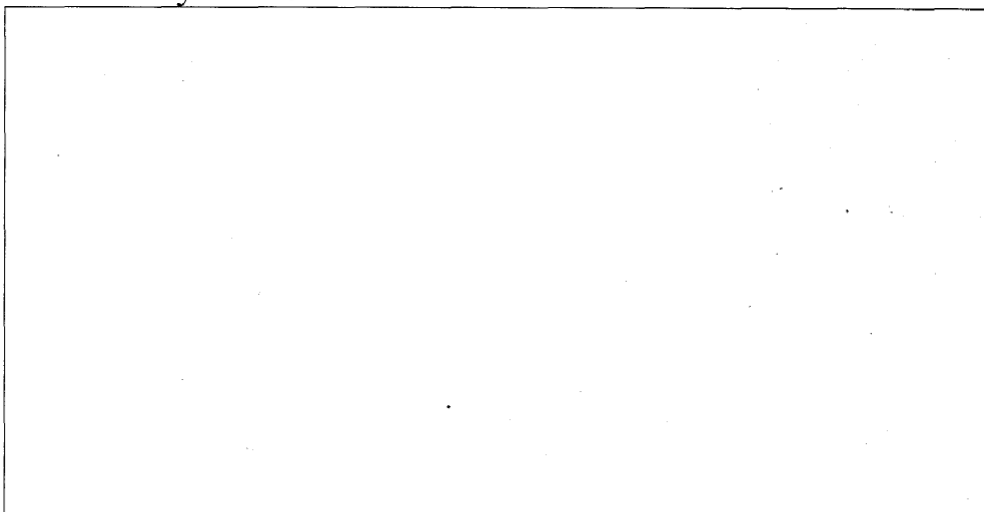
iv p +q = 8

   p - q= 5
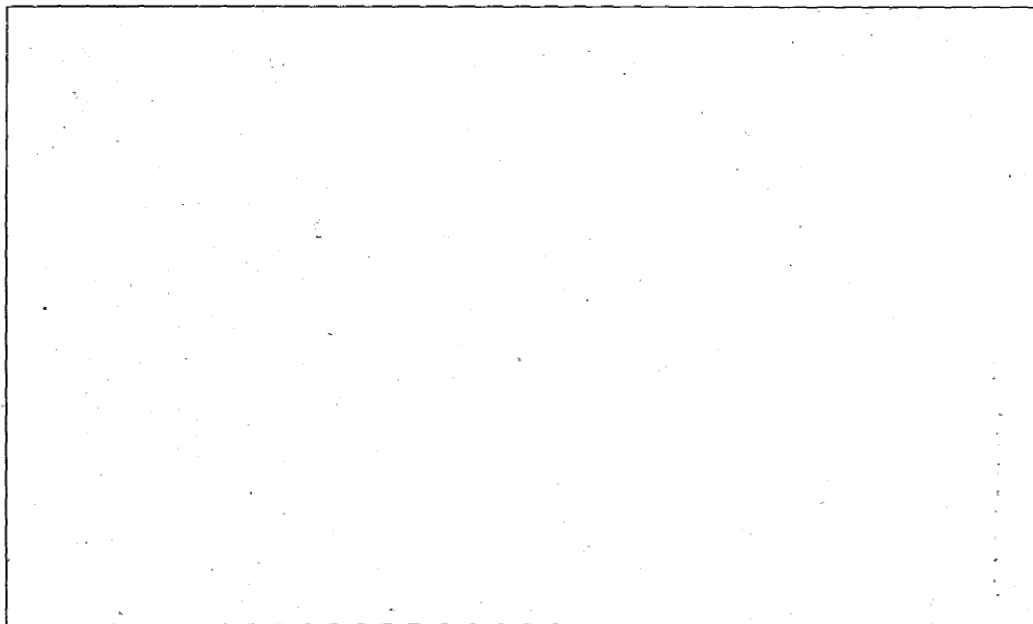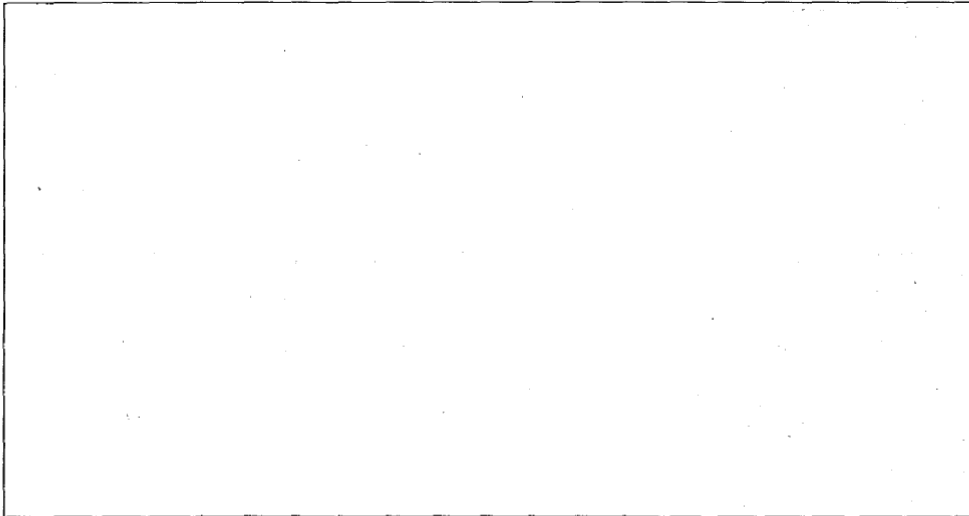
v. 2a -3b +2 = 0

   3a + 2b - 23 = 0
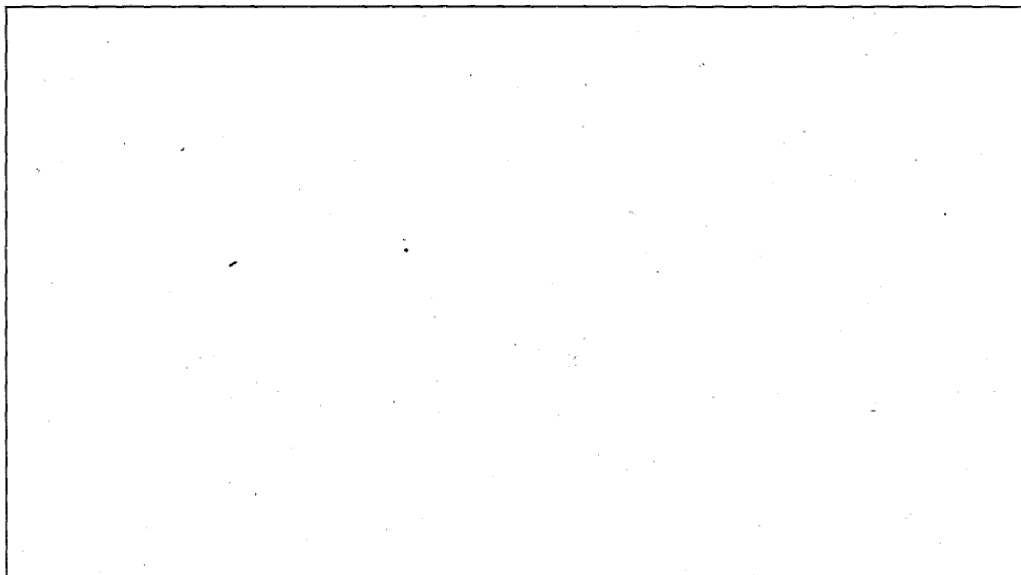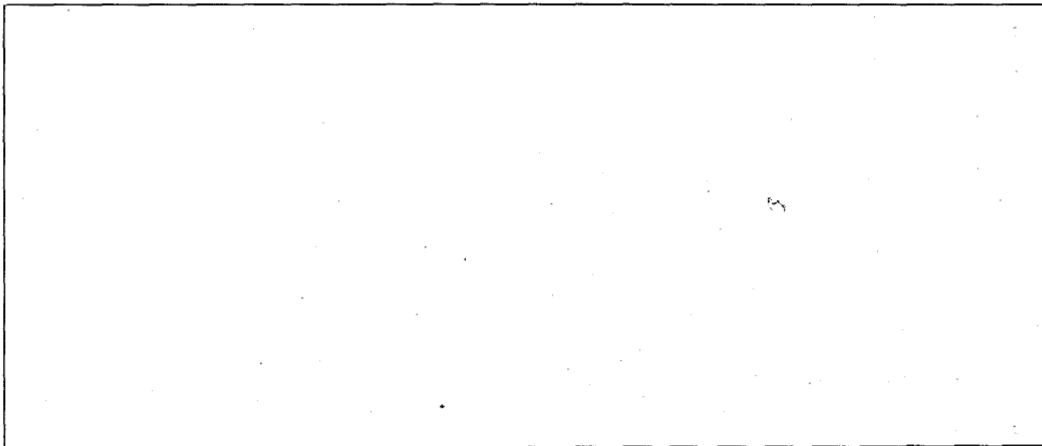
Solve the following quadratic equations by factorization
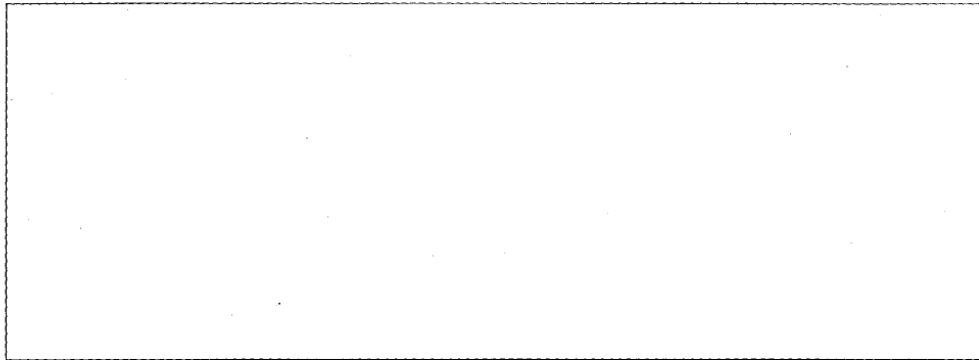
i. $a^2 + 2a - 15 = 0$
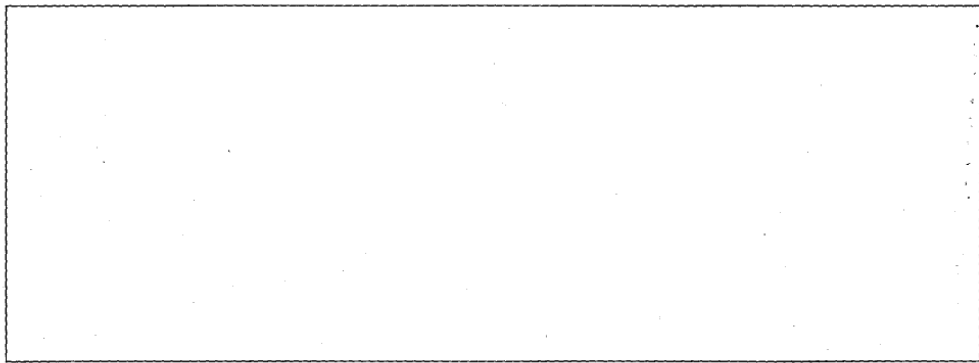
ii. $a^2 + 7a + 10 = 0$

iii. $x^2 + 7x - 18 = 0$

iv. $x^2 + 6x + 9 = 0$

v.　　　$y^2 + 20y + 100 = 0$
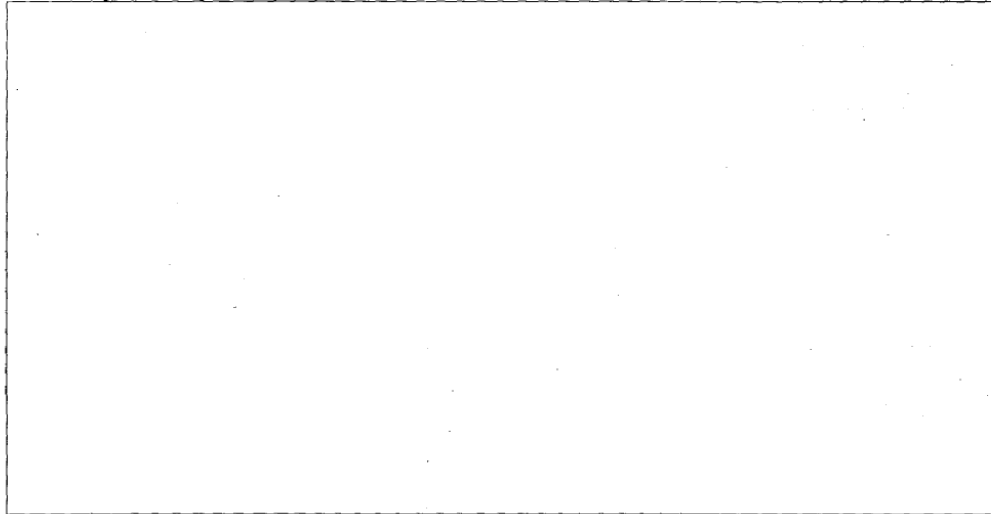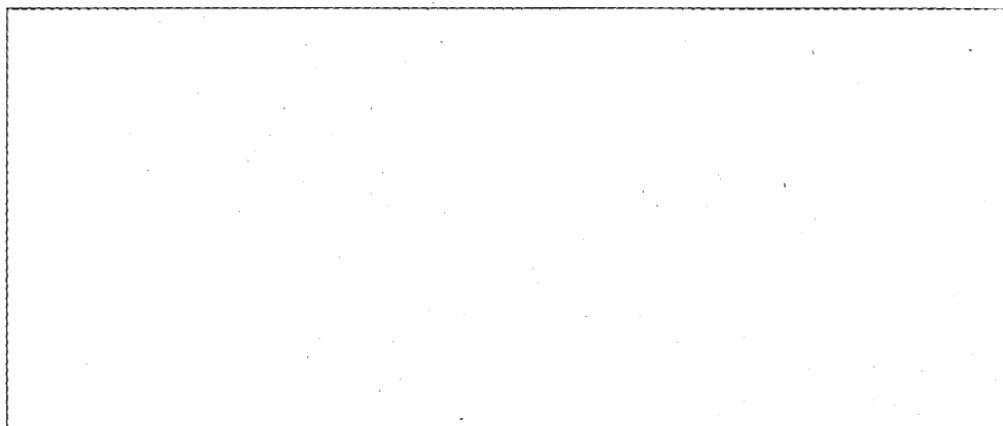
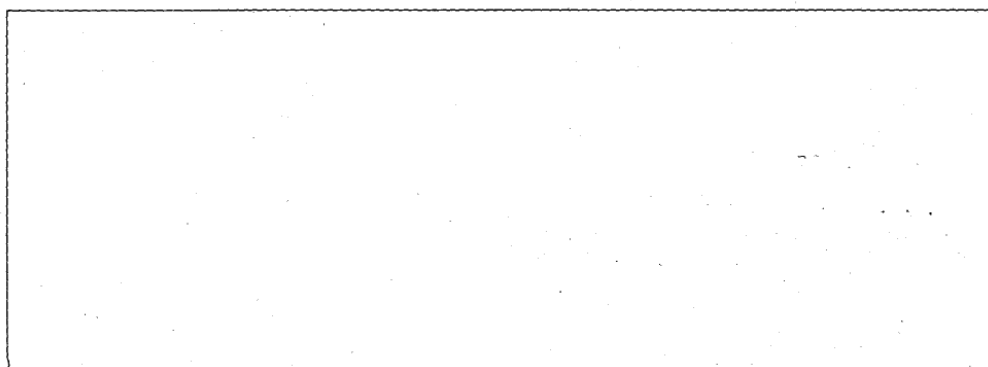**Solve the following quadratic equationsusing the root formula:** $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
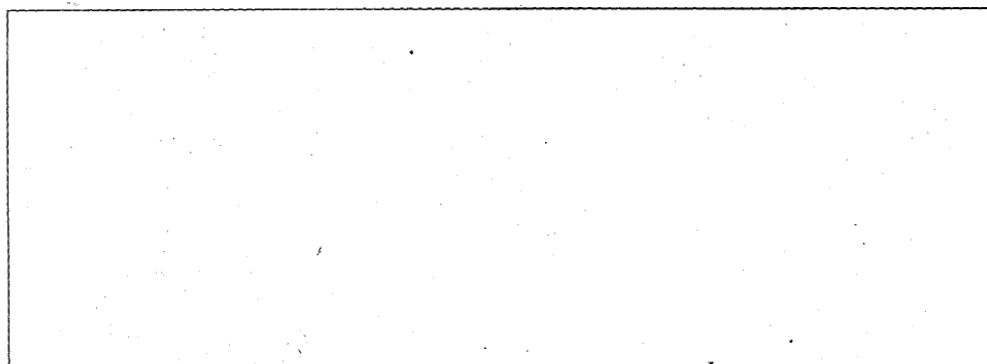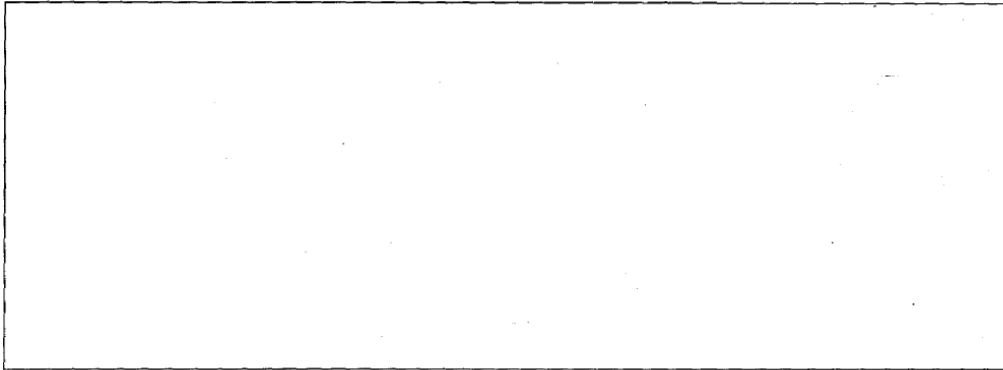
i.　$3x^2 - 2x + 1 = 0$
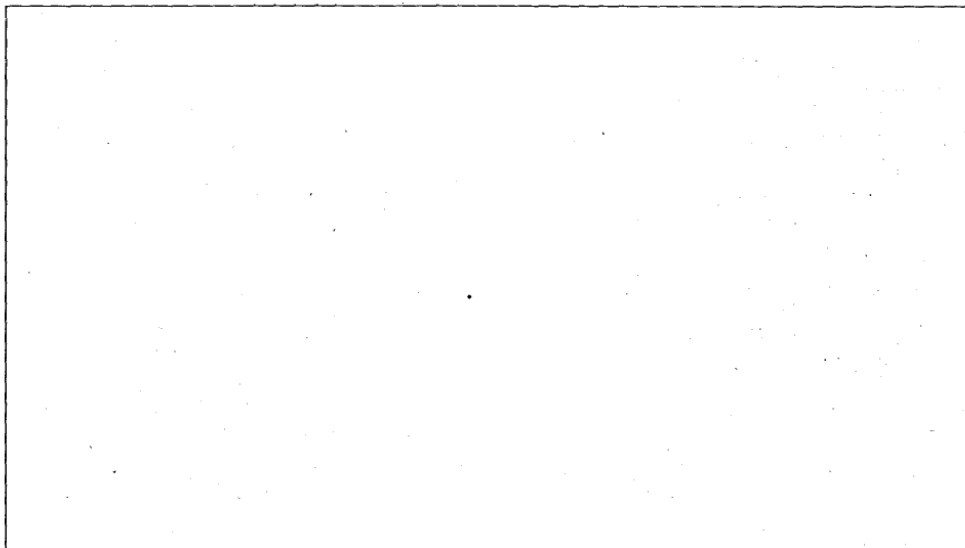
ii. $2x^2 + 5x - 1 = 0$

iii. $x^2 - 2x - 2 = 0$

iv. $x - x^2 + 4x - 5 = 0$

v. $2x + 7x + 10 = 0$

Integral Calculus

Find the integral of each of the following functions.

a. $\int x^2 \, dx$

b. $\int x^3 \, dx$

c. $\int \frac{1}{x^5} \, dx$

d. $\int \sqrt{x} \, dx$

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

f. $\displaystyle\int 4 \cos x \, dx$

g. $\displaystyle\int (x + x^2) \, dx$

h. $\displaystyle\int (3x^6 - 2x^2 + 7x + 1)$

h. $\displaystyle\int \frac{\cos x}{\sin^2 x} \, dx$

j. $\displaystyle\int \frac{t^2 - 2t^4}{t^4} \, dx$

Complete the following integration formulas (write your answer inside the box)
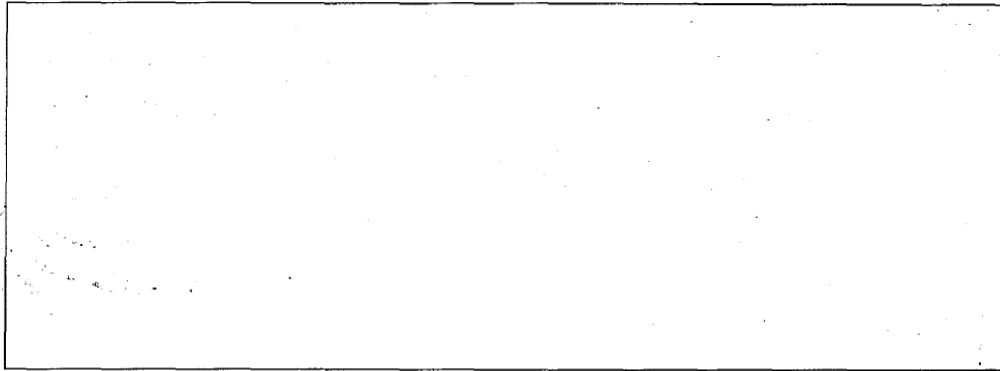
1. $\int dt$
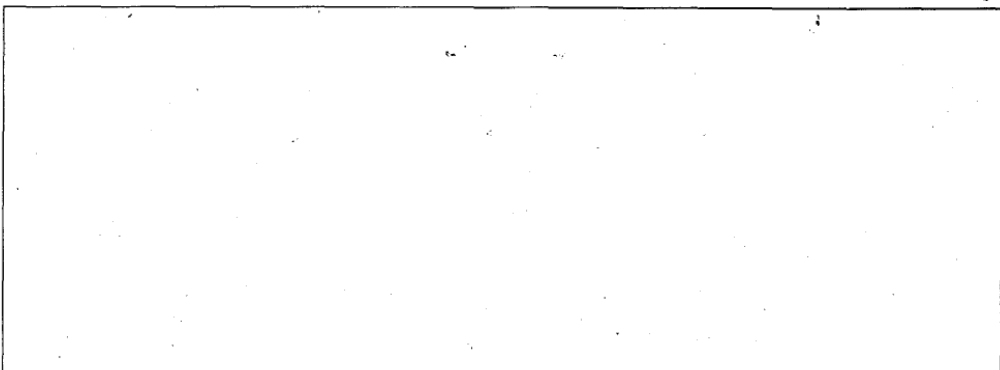
2. $\int t^r dt$

3. $\int b^r \, dt$
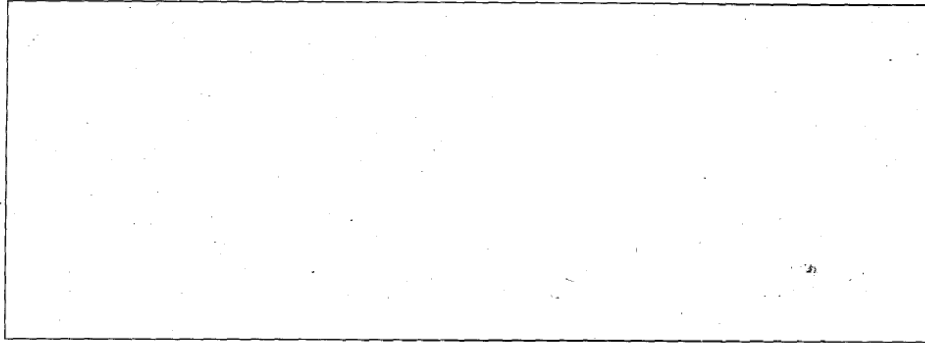
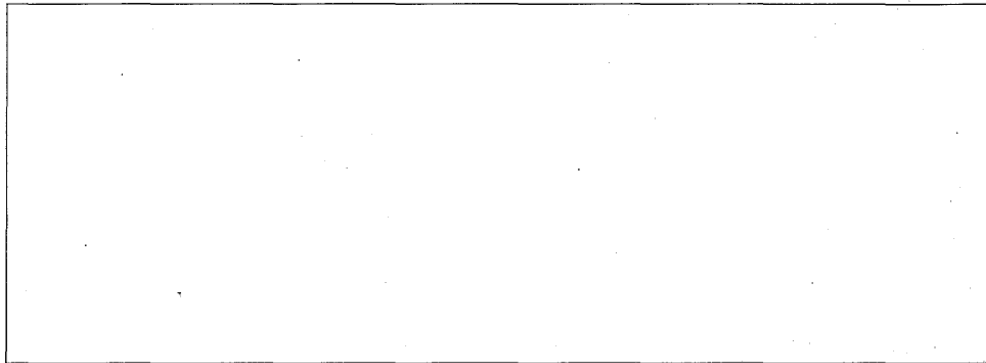4. $\int \sec^2 t \, dt$
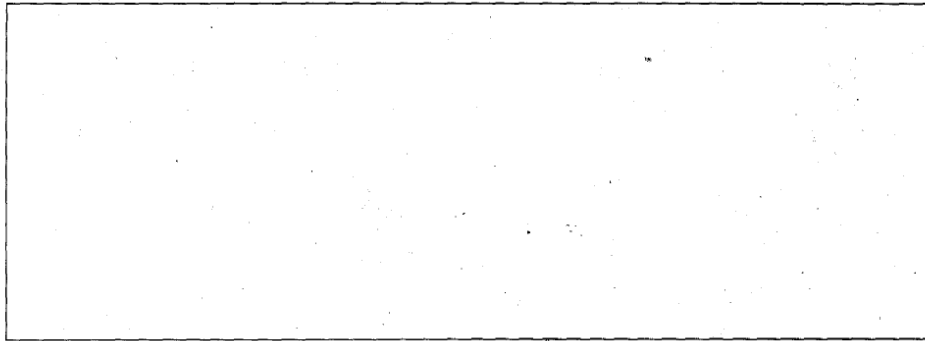
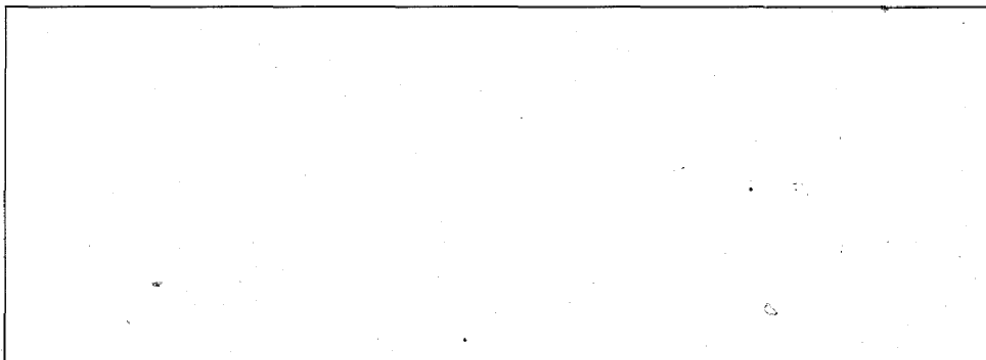5. $\int \csc t \cot t \, dt$

6. $\int \sinh t \, dt$

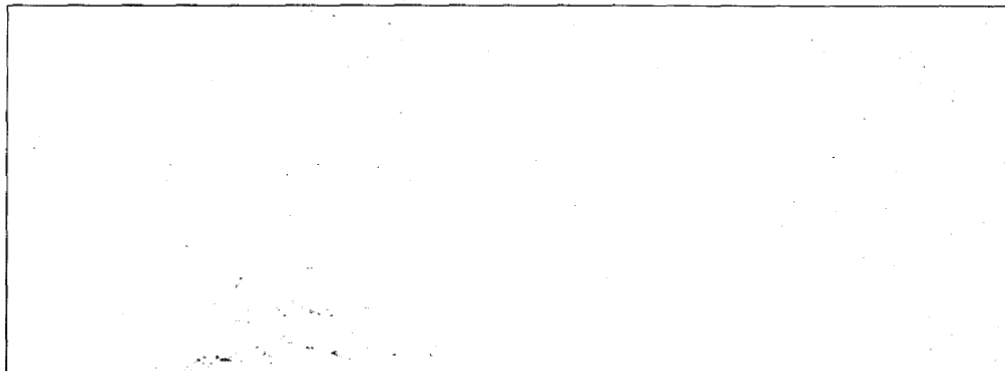**In exercises a – h below, evaluate the integral using integration by parts.**

a. $\int xe^{-x}dx$

b. $\int x\sin 2xdx$
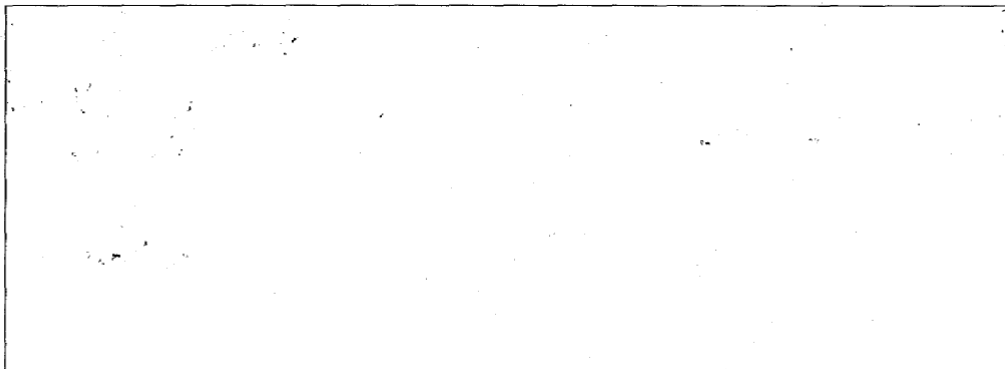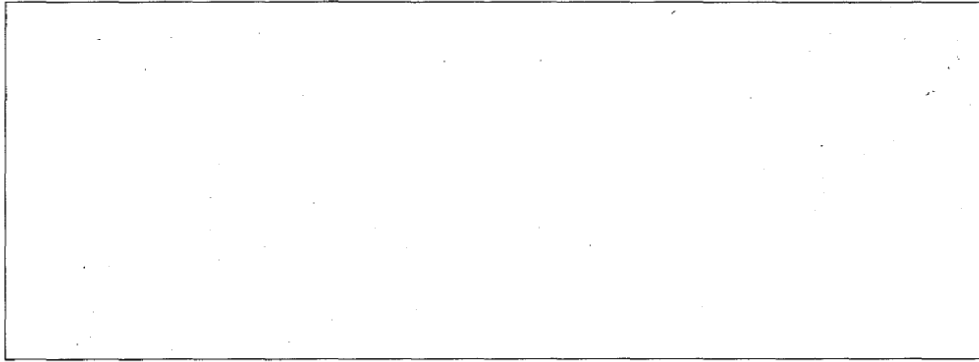
c. $\displaystyle\int \sin^{-1} x\,dx$

d. $\displaystyle\int e^{2x} \cos 3x\,dx$
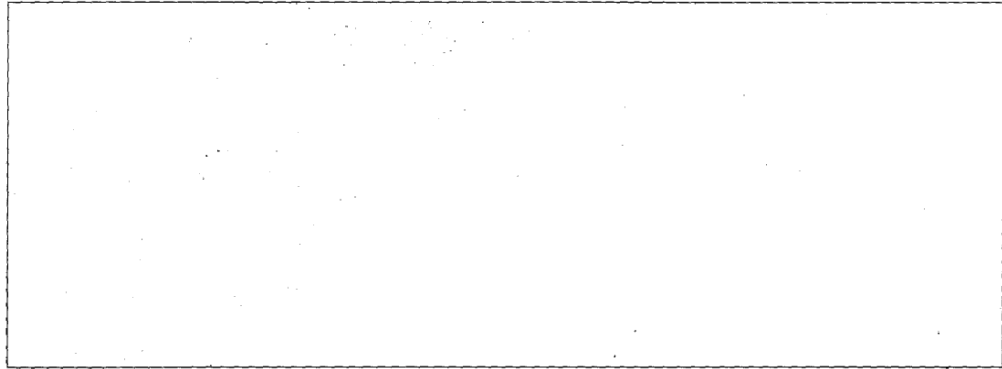
e. $\displaystyle\int_0^1 xe^{-5x}dx$
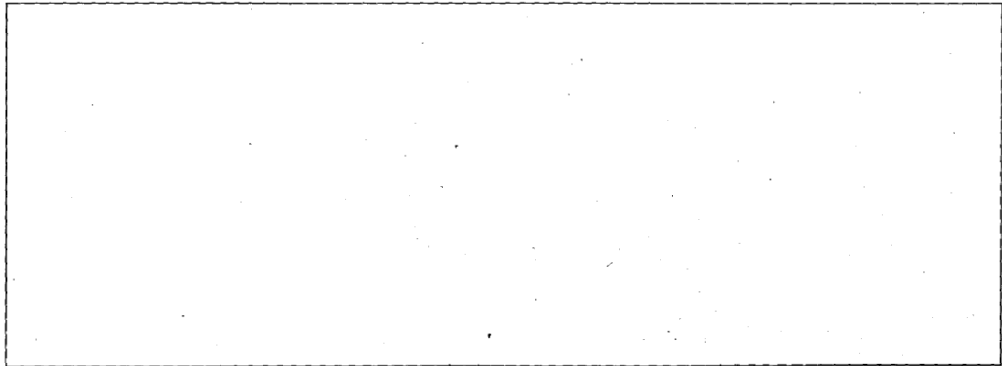
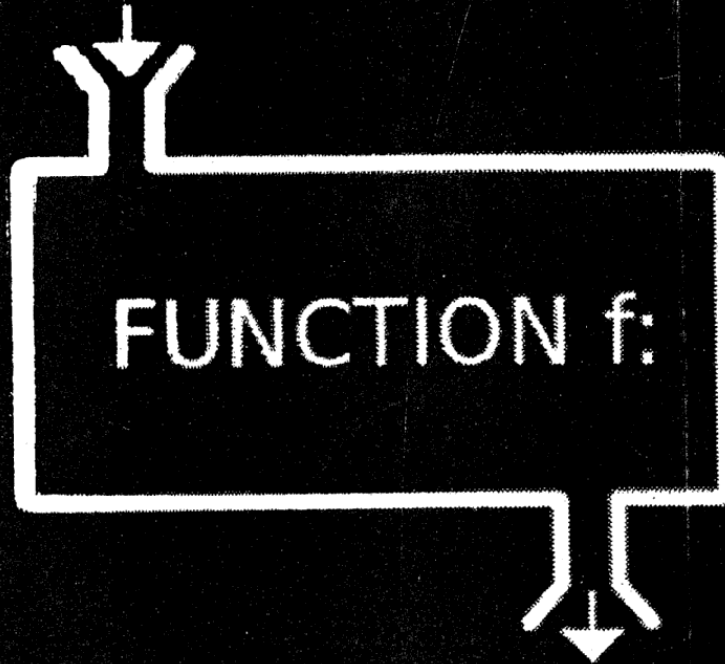f. $\displaystyle\int_{-1}^2 \ln(x+3)dx$
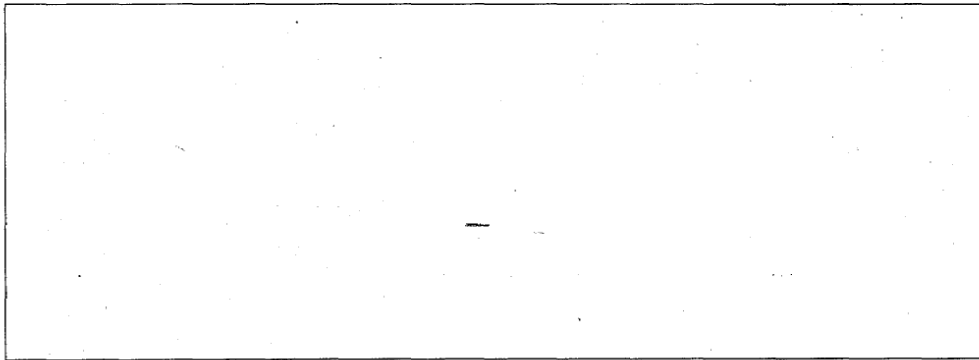
g. $\displaystyle\int_{\sqrt{e}}^{e} \frac{\ln x}{x^2}\,dx$

h. A particle moving along the x-axis has velocity function $v(t) = t^2 e^{-t}$. How far does the particle travel from time $t = 0$ to $t = 5$?

INPUT x

FUNCTION f:

OUTPUT f(x)