

1. Factor the following expression, i.e., express it as the product of (two) terms:

$$x^2 + 2x - 35$$

and use the result to write down all solutions of the equation  $x^2 + 2x - 35 = 0$

2. Factor the following expression, i.e., express it as the product of (two) terms:

$$x^2 - 2x + 5$$

and use the result to write down all solutions of the equation  $x^2 - 2x + 5 = 0$

3. Integration by parts. Calculate the following indefinite integral.

$$\int x^2 e^x dx$$

4. Solve the following system of simultaneous equations and give your answer in terms of fractions.

$$\begin{aligned} 2x + 3y &= 5 \\ -3x + 4y &= 6 \end{aligned}$$

5. For each of the following pair of simultaneous equations, is there: (a) one solution (b) infinitely many solutions or (c) no solution? Choose **one** option for each **pair** of equations below.

$$\begin{aligned} 2x + 3y &= 5 \\ -3x + 4y &= 1 \end{aligned} \tag{1}$$

$$\begin{aligned} 2x + 3y &= 5 \\ 4x + 6y &= 10 \end{aligned} \tag{2}$$

$$\begin{aligned} 2x + 3y &= 5 \\ 4x + 6y &= 9 \end{aligned} \tag{3}$$

Illustrate your answer with the help of sketches of the straight lines represented by each equation above. Your sketches should be on the same set of axes and should be properly labeled so that each line can be distinguished from the other. There should be **four** lines in total.

6. An object falls from a height  $h$  (meters) above the ground, on a planet where the acceleration due to gravity is a constant  $g$  (meters per second squared). Write down a formula for the time it takes for the object to reach the ground in the absence of air resistance, and show how this formula is derived.
7. You are driving a car at a constant speed  $u$  meters per second. At some instant, you suddenly apply the brakes, which exert a deceleration equal to  $a$  meters per seconds squared on the car. Write down a formula for the distance traveled by the car before it comes to a complete stop. Your formula should be in terms of  $a$  and  $u$  and should contain no other variables.