

**Question A:** For which values of  $a$  will the following system have  
(i) No solutions? (ii) A unique solution? (iii) Infinitely many solutions?

$$(1) \quad \begin{array}{rclcl} x & + & 2y & - & 3z & = & 4 \\ 3x & - & y & + & 5z & = & 2 \\ 4x & + & y & + & (a^2 - 14)z & = & a + 2 \end{array}$$

**Question B:** Find the values of  $A$ ,  $B$ , and  $C$  for the partial fraction expansion:

$$\frac{x^2 + x - 2}{(3x - 1)(x^2 + 1)} = \frac{A}{3x - 1} + \frac{Bx + C}{x^2 + 1}$$

**Question C:** Application: Chemistry Lab

Write a system of equations that, when solved, answers this question:

If you have two vials containing 1 Liter each of  $.5M$  HCl and  $3M$  HCl, how much of each would you mix together if you are trying to create 500 mL of  $1M$  HCl? (Remember that  $1M$  means 1 mole/Liter.)