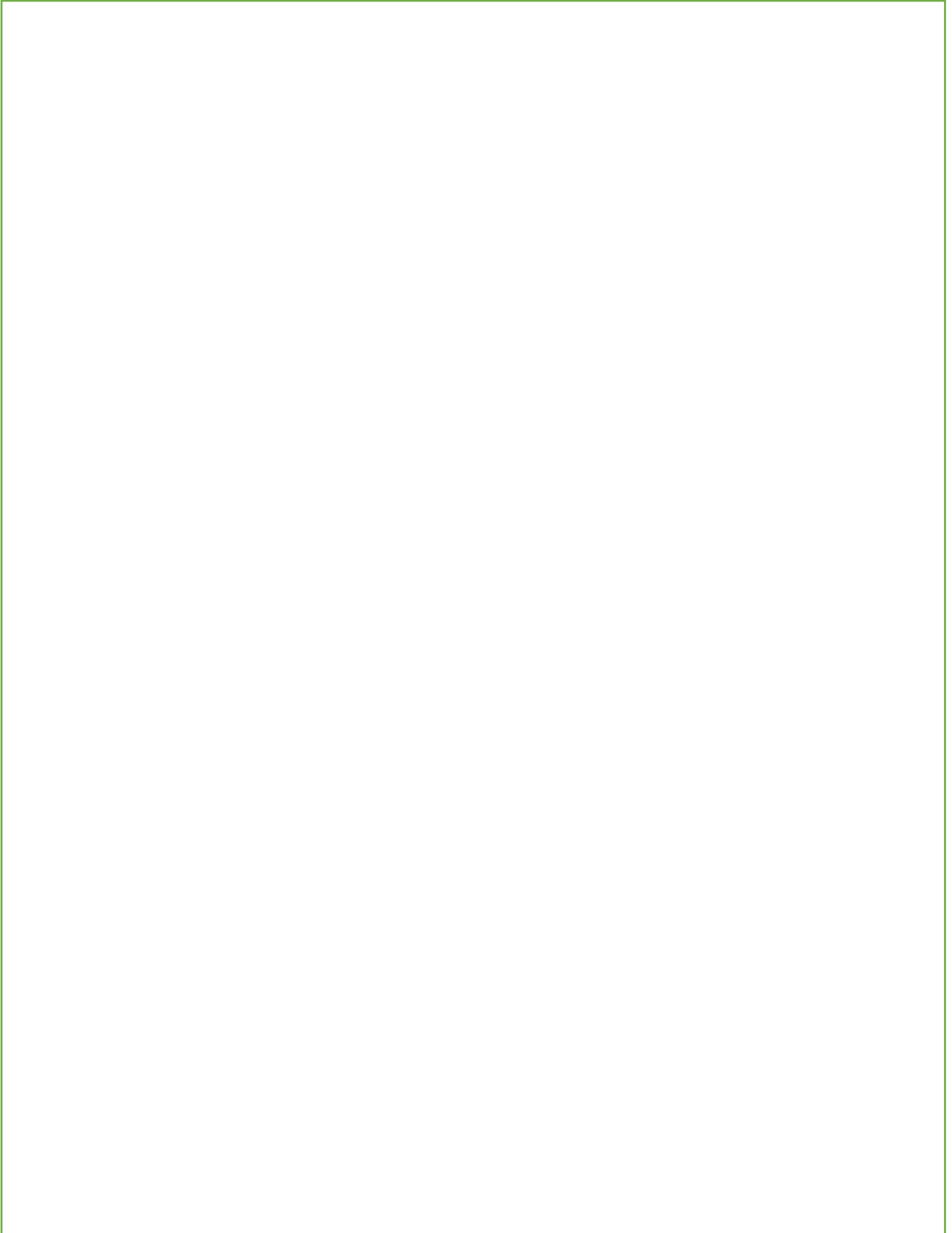


The Discriminant



Quickfire questions:

Equation	Discriminant	No. of distinct real roots
$x^2 + 3x + 4 = 0$		
$x^2 - 4x + 1 = 0$		
$x^2 - 4x + 4 = 0$		
$2x^2 - 6x - 3 = 0$		
$x - 4 - 3x^2 = 0$		
$1 - x^2 = 0$		

Example:

8. The equation $x^2 + 2px + (3p + 4) = 0$, where p is a positive constant, has equal roots.

(a) Find the value of p .

(4)

(b) For this value of p , solve the equation $x^2 + 2px + (3p + 4) = 0$.

(2)

Test Your Understanding:

1. $x^2 + 5kx + (10k + 5) = 0$ where k is a positive constant.

Given that this equation has equal roots, determine the value of k .

2. Find the range of values of k for which $x^2 + 6x + k = 0$ has two distinct real solutions.

Extension:

1. [MAT 2009 1C] Given a real constant c , the equation $x^4 = (x - c)^2$ has four real solutions (including possible repeated roots) for:
 - A) $c \leq \frac{1}{4}$
 - B) $-\frac{1}{4} \leq c \leq \frac{1}{4}$
 - C) $c \leq -\frac{1}{4}$
 - D) all values of c

2. [MAT 2006 1B] The equation $(2 + x - x^2)^2 = 16$ has how many real root(s)?

3. [MAT 2011 1B] A rectangle has perimeter P and area A . The values P and A must satisfy:
 - A) $P^3 > A$
 - B) $A^2 > 2P + 1$
 - C) $P^2 \geq 16A$
 - D) $PA > A + P$