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:



Test Your Understanding:

 1. $x^{2}+5kx+\left(10k+5\right)=0$ 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 $x^{4}=\left(x-c\right)^{2}$ has four real solutions (including possible repeated roots) for:

1. $c\leq \frac{1}{4}$
2. $-\frac{1}{4}\leq c\leq \frac{1}{4}$
3. $c\leq -\frac{1}{4}$
4. all values of $c$

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

2.

[MAT 2011 1B] A rectangle has perimeter $P$ and area $A$. The values $P$ and $A$ must satisfy:

1. $P^{3}>A$
2. $A^{2}>2P+1$
3. $P^{2}\geq 16A$
4. $PA>A+P$

3.

Exercise 2G Page 32