

## 231 Tutorial Sheet 16.<sup>12</sup>

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### Useful fact:

- To solve Euler's equation use the substitution

$$x = \exp z$$

### Questions

1. Obtain the general solutions of the ODEs

(a)  $y'' + y' + 3y = 0$

(b)  $y'' + y = f(x)$ , where  $f$  is the periodic square wave defined by

$$f(x) = \begin{cases} 1, & 0 < x < \pi \\ -1, & -\pi < x < 0 \end{cases} \quad \text{and } f(x + 2\pi) = f(x)$$

(c)  $y'' + y' + 3y = e^{-|x|}$ .

2. Solve the Euler type equations

(a)  $x^2 y'' + 4xy' + y = 0$ .

(b)  $x^2 y'' + 3xy' + y = 0$ .

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<sup>2</sup>Including material from Chris Ford, to whom many thanks.