

## M463 Homework 19

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Let  $X$  be a RV in  $[0, 1]$  with pdf  $f_X(x) = 2x$ , and let  $Y$  be an independent RV also in  $[0, 1]$  with pdf  $f_Y(y) = 2(1 - y)$ . Find the pdf of  $Z = X + Y$ .

**Solution:**

Using the Density Convolution Formula:

$$f_Z(z) = \int_0^z f_X(x)f_Y(z-x)dx = \int_0^z 2x2(1-z+x)dx = 4 \int_0^z x-xz+x^2dx = 4 \left[ \frac{x^2}{2} - \frac{x^2z}{2} + \frac{x^3}{3} \right]_0^z = \boxed{2z^2 - \frac{2}{3}z^3}$$