

## STEP III, 1998, Q2

2 Let

$$I(a, b) = \int_0^1 t^a (1-t)^b dt \quad (a \geq 0, b \geq 0).$$

- (i) Show that  $I(a, b) = I(b, a)$ ,
- (ii) Show that  $I(a, b) = I(a+1, b) + I(a, b+1)$ .
- (iii) Show that  $(a+1)I(a, b) = bI(a+1, b-1)$  when  $a$  and  $b$  are positive and hence calculate  $I(a, b)$  when  $a$  and  $b$  are positive integers.



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