8.

$$I_n = \int_0^k x^n (k - x)^{\frac{1}{2}} \, dx \qquad n \geqslant 0$$

where k is a positive constant.

(a) Show that

$$I_n = \frac{2kn}{3 + 2n} I_{n-1} \qquad n \geqslant 1$$

(5)

Given that

$$\int_0^k x^2 (k - x)^{\frac{1}{2}} \, dx = \frac{9\sqrt{3}}{280}$$

(b) use the result in part (a) to determine the exact value of k.

(4)

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