Opgave 8.2.51

Reaction to a Drug The rate of reaction to a drug is given by

$$r'(t) = 2t^2e^{-t}$$

where t is the number of hours since the drug was administered. Find the total reaction to the drug from t = 1 to t = 6

— s. 493

Opstil funktion

$$r(t) = \int 2t^2e^{-t}\ dt$$

Vælg passende v og u, så vi kan lave delvis integration

$$u = 2t^2$$
$$u' = 4t$$
$$v' = e^{-t}$$
$$v = \int e^{-t} = -e^{-t}$$

Opstil formel for delvis integration

$$\int u \cdot v' = u \cdot v - \int v \cdot u'$$

Indsæt

$$r(t) = 2t^2 \cdot (-e^{-t}) - \int -e^{-t} \cdot 4t\ dt$$
$$= -2t^2e^{-t} + 4\int te^{-t}\ dt$$

Vi skal nu gøre det igen for at løse det nye indre integrale

$$\int te^{-t}\ dt$$

$$u = t \Leftrightarrow u' = 1$$
$$v' = e^{-t} \Leftrightarrow v = \int e^{-t} = -e^{-t}$$

Indsæt

$$-te^{-t} - \int -e^{-t} \cdot 1$$
$$-te^{-t} - e^{-t}$$
$$-e^{-t} \cdot (t+1)$$

Indsæt tilbage i den originale ligning

$$r(t) = -2t^2e^{-t} - 4e^{-t} \cdot (t+1)$$

Vi skal nu finde arealet under funktionen fra 1 til 6

$$r(1) = -3.68$$
$$r(6) = -0.25$$

$$\begin{aligned} r(t) \ |_1^6 &= r(6) - r(1) \\ &= 3.43 \end{aligned}$$