Last time: Integration by substitution: "the Chain Rule"

Today: Integration by parts: "the Product Rule"

Term test 3: Thursday, February 3, 4-8pm.

Homework before Wednesday’s class: watch videos 9.7, as well as 9.8, 9.9.
Use integration by parts (possibly in combination with other methods) to compute:

1. $\int x e^{-2x} \, dx$
2. $\int x^2 \sin x \, dx$
3. $\int \ln x \, dx$
4. $\int x \arctan x \, dx$
5. $\int \sin \sqrt{x} \, dx$
6. $\int x^2 \arcsin x \, dx$
7. $\int e^{\cos x} \sin^3 x \, dx$
8. $\int e^{ax} \sin(bx) \, dx$
Compute

\[ \int_1^e (\ln x)^4 \, dx \]
Compute

\[ \int_1^e (\ln x)^4 \, dx \quad \quad \quad \int_1^e (\ln x)^{10} \, dx \]
Compute

\[ \int_1^e (\ln x)^4 \, dx \quad \int_1^e (\ln x)^{10} \, dx \]

There is a more efficient approach. Call

\[ I_n = \int_1^e (\ln x)^n \, dx \]

Use integration by parts on \( I_n \). You will get an equation with \( I_n \) and \( I_{n-1} \). Now solve the previous questions.
The error function

The following function is tabulated.

\[ E(x) = \int_0^x e^{-t^2} dt. \]
The error function

The following function is tabulated.

\[ E(x) = \int_{0}^{x} e^{-t^2} \, dt. \]

Write the following quantities in terms of \( E \):

1. \( \int_{1}^{2} e^{-t^2} \, dt \)

2. \( \int_{0}^{x} t^2 e^{-t^2} \, dt \)

3. \( \int_{0}^{x} e^{-2t^2} \, dt \)
The error function

The following function is tabulated.

\[ E(x) = \int_{0}^{x} e^{-t^2} \, dt. \]

Write the following quantities in terms of \( E \):

1. \[ \int_{1}^{2} e^{-t^2} \, dt \]
2. \[ \int_{0}^{x} t^2 e^{-t^2} \, dt \]
3. \[ \int_{0}^{x} e^{-2t^2} \, dt \]
4. \[ \int_{0}^{1} e^{-t^2+6t} \, dt \]
5. \[ \int_{x_1}^{x_2} e^{-(t-\mu)^2/\sigma^2} \, dt \]
6. \[ \int_{0}^{x} \frac{e^{-t}}{\sqrt{t}} \, dt \]