Common Calculus Mistakes
Definite Integral

Some problems provide the opportunity for more than one mistake.

The Goal

Find

$$\int_0^2 e^{-x}\,dx$$

The Mistakes

Find the mistakes:

1.

$$\int_0^2 e^{-x}\,dx = e^{-x}\Big|_0^2 = e^{-2} - e^0 = e^{-2} - 1$$

Need a hint? Look carefully at the red part:

$$\int_0^2 e^{-x}\,dx = e^{-x}\Big|_0^2 = e^{-2} - e^0 = e^{-2} - 1$$

2.

$$\int_0^2 e^{-x}\,dx = -e^{-x}\Big|_0^2 = -e^{-2} + (-e^0) = -e^{-2} - 1$$

Need a hint? Look carefully at the red part:

$$\int_0^2 e^{-x}\,dx = -e^{-x}\Big|_0^2 = -e^{-2} + (-e^0) = -e^{-2} - 1$$

A Correct Solution

$$\int_0^2 e^{-x}\,dx = -e^{-x}\Big|_0^2 = -e^{-2} - (-e^0) = -e^{-2} + 1 = 1 - e^{-2}$$

Explanations

In the first mistake the antiderivative is computed incorrectly - the negative sign is needed.

In the second mistake a common sign error is made. If F(x) is an antiderivative of the integrand (the function in the integral), the value of the definite integral from a to b is F(b)-F(a), which applies *even if F(x) has a minus sign in front of it*. So if $F(x) = -e^{-x}$, then $F(b)-F(a) = (-e^{-b}) - (-e^{-a}) = e^{-a} - e^{-b}$.