CQ #3: An investment is made at the continuous rate of \( f(t) = 12e^{-t} \) thousand dollars per year with 4% annual interest compounded continuously. What is its value in twenty years?

\[
a) \left. e^{0.04(20)} \right|_0^{20} 12e^{-0.04t} \, dt \\
b) \int_0^{20} 12e^{-0.96t} \, dt \\
c) \int_0^{20} 12e^{-1.04t} \, dt \\
d) \left. e^{0.04(20)} \right|_0^{20} 12e^{-1.04t} \, dt \\
e) \left. e^{0.04(20)} \right|_0^{20} 12e^{1.04t} \, dt
\]

Amount invested at time \( t \) is \( 12e^{-t} \) dollars.

Multiply by \( e^{rt} \) with \( r = 0.04 \).

Integrate. Multiply by \( e^{rT} \) with \( r = 0.04 \) and \( T = 20 \)

Get:

\[
e^{0.04(20)} \left[ \int_0^{20} 12e^{-t} e^{-0.04t} \, dt \right]
= e^{0.04(20)} \left[ \int_0^{20} 12e^{-1.04t} \, dt \right]
\]

units of \( t \): Years

Units of \( f(t) \) etc.

Thousands of \( \$ \)
CQ #4: Write an expression for the amount of money that would need to be invested now in order to match the future value of the continuous income stream \( f(t) = 8000 \) Euro/year in ten years assuming 2% continuously compounded annual interest.

a) \( 8000e^{0.02 \cdot 10} \)

b) \( e^{0.02(10)} \int_0^{10} 8000e^{-0.02t} \, dt \)

c) \( \int_0^{10} 8000e^{-0.02t} \, dt \)

d) \( \int_0^{10} 8000e^{0.02(10-t)} \, dt \)

e) \( \int_0^{10} 8000e^{0.02t} \, dt \)

Units of time are years, starting with \( t = 0 \) in.

\[ \int_0^{10} f(t) e^{-rt} \, dt \]

\[ = \int_0^{10} 8000 e^{-0.02t} \, dt \]

\( T = 10 \)

\( r = 0.02 \)

\( f(t) = 8000 \)