Find the present value, using the present value formula and a calculator. (Round your answer to the nearest cent.) Achieve $225,500 at 8.45% compounded continuously for 8 years, 145 days.

Solution:

The present value, PV; of a future payment FV; is the amount that would have to be deposited in a bank account today to produce exactly FV in the account at the relevant time future. If interest is compounded n times a year at an annual rate r for t years, then the relationship between FV and PV is given by the formula:

$$FV = PV\left(1 + \frac{r}{n}\right)^{nt}$$

PV – is the Present value;

r - is the interest rate (expressed as a decimal);

n - is the number of compounding a year;

t - is the total number of years.

From this formula we can find Present value:

$$PV = \frac{FV}{\left(1 + \frac{r}{n}\right)^{nt}}$$

But in our case we have the continuous compound interest, the formula is given by:

$$FV = PVe^{rt}$$

From formula find PV:

$$PV = \frac{FV}{e^{rt}}$$

The present value with continuous compounding formula is used to calculate the current value of a future amount that is earned at a continuously compounded rate. There are three concepts to consider in the present value with continuous compounding formula: time value of money, present value, and continuous compounding.

Time Value of Money - The present value with continuous compounding formula relies on the concept of time value of money. Time value of money is the idea that a specific amount today is worth more than the same amount at a future date.

Present Value - The basic premise of present value is the time value of money.

Continuous Compounding - Continuous Compounding is essentially compounding that is constant. Ordinary compounding will have a compound basis such as monthly, quarterly, semi-annually, and so forth. However, continuous compounding is nonstop, effectively having an infinite amount of compounding for a given time.

In our task we can find Present value using formula notice below:

$$PV = \frac{FV}{e^{rt}}$$

$FV - future\ value = \$225{,}500$

$e \approx 2.7182818284$

$r = 8.45\%$

$n = \frac{145}{365} = 0.397260274$

We have total amount of compounded continuously 8 years, so $n = (0.397260274 + 8) = 8{,}397260274$

$n = 8{,}397260274$

$$PV = \frac{\$225{,}500}{2.7182818284^{(0.0845 \cdot 8{,}397260274)}} = \$110{,}913.616$$

Present value equals $= \$110{,}913.62$

Answer: $\boldsymbol{PV = \$110{,}913.62}$