

4.7 PreExam: Exponential Functions and Compound Interest

Construct an exponential function symbolically given a description of the relationship F.LE.2.ii

Compound interest formula:

$$FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn} \text{ where FV is the future value,}$$

PV is the present value, n is the number of years,

k is the number of compounding periods per year,

r% is the nominal annual rate of interest

1. Write down the formula for a function $f(x)$ that increases 15% for each increase of 1 in input value x .

$$f(x) = 1.15^x$$

2. The price of a share of stock in a particular company is \$2.25 per share in 2010. Assume that it increases in value by 6% annually thereafter.

- (a) Write an equation representing the value of the stock $P(t)$, in dollars, t years after 2010.

$$P(t) = 2.25 \times \left(1 + \frac{6}{100}\right)^t = 2.25 \cdot 1.06^t$$

- (b) What does $P(30)$ represent in this context?

30 years after 2010, or in 2040, the price of a share of the stock

3. An investment of \$5,000 compounds monthly with an annual interest rate of 4%.

- (a) How many compounding periods are there per year?

$$k = 12$$

- (b) First write the formula for, and then calculate, the account balance of principal and interest after three years.

$$FV = 5000 \times \left(1 + \frac{4}{100 \cdot 12}\right)^{12 \cdot 3}$$

$$= \$5636.359... \approx \$5636.36$$

4. The graph shows the exponential function $f(x)$.

- (a) Write down the initial value of the function.

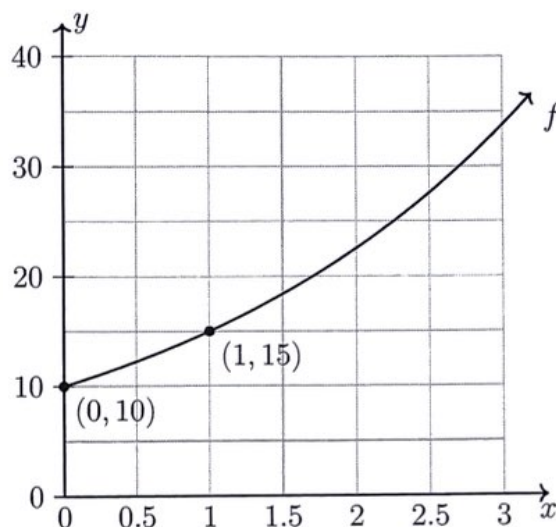
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- (b) By what factor do the values of f increase each time x increases by 1?

$$\frac{15}{10} = 1.5$$

- (c) By what factor would f increase when the input increases by 10?

$$(1.5)^{10} = 57.665...$$



5. A company depreciates a piece of equipment which was purchased in 2022 at a constant annual rate. The equation representing the value of the equipment $V(t)$, in dollars, t years after 2022 is $V(t) = 12,000 \times (0.85)^t$.

- (a) Write down the initial value of the equipment.

\$12,000

- (b) What does the value 0.85 tell us about the situation?

The annual multiplication factor is 0.85. The equipment is worth 85% of the previous year's value.

- (c) By what percent does the equipment's value decrease each year?

15%

- (d) Sketch the graph of the function.

