7.1c Geometic Sequences

Geometric Sequences

For his science experiment, Ahad exposed a 100 mm plant to a special light for 20 hours each day. He found that the plants grew about 10% each month.

a)   How tall will the plant be at the beginning of the eighth month?

$m_1 = 100$ $m_4 = 133.1$ $m_7 = 177.1561$
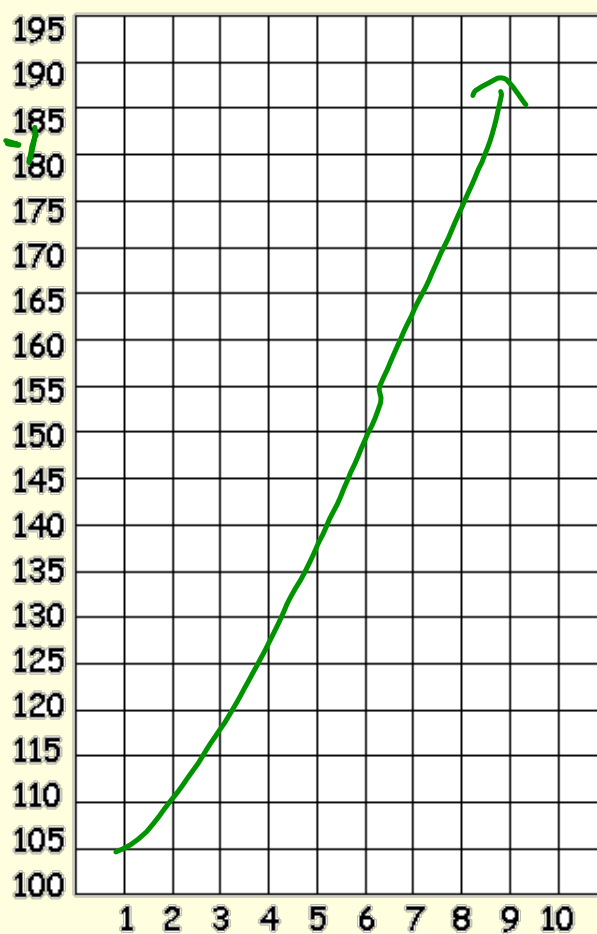
$m_2 = 110$ $m_5 = 146.41$ $m_8 = 194.87171$

$m_3 = 121$ $m_6 = 161.051$

b)   Graph the height at the beginning of each month.

$$P(t) = 100\left(1 + 0.1\right)^{t-1}$$

Geometric Sequences

A <u>geometric sequence</u> is a list of numbers with a <u>common ratio</u> between each successive term

5 $\overset{\times 3}{,}$ 15 $\overset{\times 3}{,}$ 45 , 135 , 405 , 1215 , ...

6 $\overset{\times -4}{,}$ -24 $\overset{\times -4}{,}$ 96 , -384 , 1536 , -6144 , ...

81 $\overset{\times \frac{1}{3}}{,}$ 27 $\overset{\times \frac{1}{3}}{,}$ 9 , 3 , 1 , ⅓ , ...

1280 $\overset{\times \frac{3}{4}}{,}$ 960 $\overset{\times \frac{3}{4}}{,}$ 720 , 540 , 405 , 303.75

15 , 30 , 45 , 60 , 75 , 90 , ...   ← arithmetic

$\overset{}{\underset{+15 \quad +15}{}}$

Geometric Sequences

The general, or nth, term of a geometric sequence is found by

$$a_n = a_1 r^{n-1}$$

$$U_n = U_1 r^{n-1}$$

Geometric Sequences

Find the formula for the nth (general) term in the sequence 3, 12, 48…

$$U_n = 3(4)^{n-1}$$

What kind of function is this?

exponential growth

Find the 11th term.

$$U_{11} = 3(4)^{11-1} = 3,145,728$$

Geometric Sequences

Find the first term in the sequence for which $a_5 = 24$ and $r = 2$.

$$U_n = U_1 \, r^{n-1}$$

$$24 = U_1 (2)^{5-1}$$

$$\frac{24}{16} = U_1 \frac{(16)}{16}$$

$$\boxed{U_1 = 1.5}$$

Geometric Sequences

Find a geometric sequence that has 2 terms between -2 and 54.

$$-2, \underline{6}, \underline{-18}, 54$$

$$54 = -2 \cdot r^{4-1}$$

$$\sqrt[3]{27} = \sqrt[3]{r^3}$$
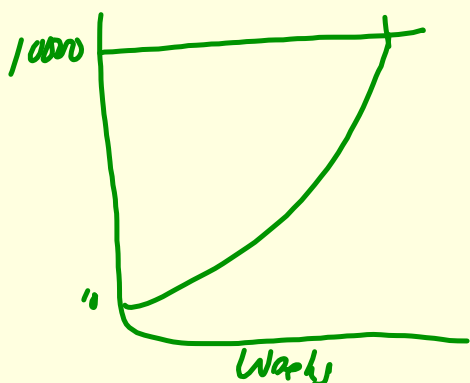
$$u_n = -2 \cdot (-3)^{n-1}$$

$$r = -3$$

Geometric Sequences

A colony of algae increases its size by 15% each week. The lake will be considered "seriously polluted" when there is an excess of 10,000 grams of algae in the lake. If 10 grams are placed in the lake, how long will it take for the lake to be seriously polluted?

$$r = 1 + 0.15 = 1.15$$

$$10000 = 10 \cdot 1.15^{n-1}$$

$$n = 50.4 \text{ weeks.}$$

Homework:

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