Ch.4b Exponential and Rational Models

In 1984, the world population was about 4.8 billion. It was growing at a rate of 2% each year. What was the population in 1985? In 1990? What will it be in 2050?

$(4.8)(0.02) + 4.8 = \square$

$\square(0.02) + \square$

When a population is changing at a constant percentage rate, r, each year, then the model for growth or decay is

$$P(t) = P_0(1+r)^t$$

where P_0 is the initial value at time t = 0
r is the growth / decay rate expressed as a decimal
t is the time in years.

$P(t) = 4.8(1+0.02)^t$

1985, $t=1 \rightarrow P(1) = 4.8(1+0.02)^1$
$= 4.896$

1990, $t=6 \rightarrow P(6) = 4.8(1+0.02)^6$
$= 5.406$

2050, $t=66$ $P(66) = 17.736$ billion People

1. **Interpreting Population Functions:** Tell whether the population model is an exponential growth function or exponential decay function. Then identify the initial population and the constant percentage rate of growth or decay.

a) $P(t) = 15 \cdot 1.0135^t$
b) $P(t) = 35 \cdot 0.93^t$
c) $g(x) = 43 \cdot 1.05^x + 7$

$P(t) = P_0(1+r)^t$

$= 15 \cdot (1 + 0.0135)^t$ increasing!

$P_0 = 15$ $r = 0.0135$ 1.35%

b) $P(t) = 35(1 - 0.07)^t$ decreasing $r = 0.07$ -7%

$P_0 = 35$

c) $g(x) = 43 \cdot (1 + 0.05)^x + 7$ increasing $r = 0.05$ 5%

$P_0 = 50$

$(43 + 7)$

2. **Writing Population Functions:** Write an exponential function that models the given conditions. $P(t) = P_0(1+r)^t$

a) A population begins at 12, and increases at a rate of 12% per year

$P(t) = 12(1+0.12)^t$

b) A population begins at 5, and decreases at a rate of 8% per year

$P(t) = 5(1-0.08)^t$

c) A population begins at 502,000, and decreases at a rate of 1.7% per year

$P(t) = 502000(1-0.017)^t$

In 1984, the world population was about 4.8 billion. It was growing at a rate of 2% each year.

What was the population in 1985?

In 1990?

What will it be in 2050?

Homework Assignment:

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