Homework: pg 261 # 1ad, 2ab, 3, 4, 5, 7, 8, 12, 13, 15

**Applications of Exponential Functions: Part 1**

**Exponential Growth/ Decay**

Exponential growth/decay is used to model several real-life scenarios:

* The increasing value of an investment.
* The depreciation of a car's value.
* The increase in population.
* The decrease in light intensity as it travels through water.
* The exponential growth of infected cases during a pandemic.

In general, exponential growth/decay relationships can be modeled by an equation of the form:

 Exponential growth 🡪 $y=a(1+r)^{x}$

Exponential decay 🡪 $y=a(1-r)^{x}$

where

* a is the initial amount
* $\pm r$ is the percentage growth/decay rate respectively
* x is the number of periods of growth/decay
* y is the future amount

It is also possible to combine both equations above by writing them as a single equation as follows:

$$y=ab^{x}$$

where b (the growth/decay factor) is given by

* $b=1+r$ for exponential growth
* $b=1-r$ for exponential decay

**Example 1**

Initially, ten people are infected by a novel virus. The number of people infected grows exponentially by 9% each day. How many people will be infected after 100 days?

**Example 2**

Finnegan purchases a Saab for $48,000. The value of the car depreciates by 18% each year. How much will the car be worth after 5 years?

**Example 3**

The intensity of light projected downwards into water drops exponentially by 8% for every meter in depth measured from the surface. If a waterproofed 60-Watt bulb is projected into a lake, how intense is the light at a depth of 7 m?

**Example 4**

The population of Guelph is currently 135,000. The number of residents in Guelph is expected to increase by about 2.2% each year.

a) What is the projected population of Guelph in 15 years?

b) When will the population of Guelph be 250,000?