## Unit 4 Lesson 5: Changes Over Rational Intervals

### 1 Changes Over Intervals (Warm up)

#### Student Task Statement

Consider the exponential function . For each question, be prepared to share your reasoning with the class.

1. By what factor does increase when the exponent increases by 1?
2. By what factor does increase when the exponent increases by 2?
3. By what factor does increase when the exponent increases by 0.5?

### 2 Machine Depreciation

#### Student Task Statement

After purchase, the value of a machine depreciates exponentially. The table shows its value as a function of years since purchase. If a spreadsheet tool is available, consider using it to help you reason about the following questions.

| years since purchase | value in dollars |
| --- | --- |
| 0 | 16,000 |
| 0.5 |  |
| 1 | 13,600 |
| 1.5 |  |
| 2 | 11,560 |
| 3 | 9,826 |

1. The value of the machine in dollars is a function of time , the number of years since the machine was purchased. Find an equation defining and be prepared to explain your reasoning.
2. Find the value of the machine when is 0.5 and 1.5. Record the values in the table.
3. Observe the values in the table. By what factor did the value of the machine change:
   1. every one year, say from 1 year to 2 years, or from 0.5 years to 1.5 years?
   2. every half a year, say from 0 to 0.5 year, or from 1.5 years to 2 years?
4. Suppose we know , the value of the machine years since purchase. Explain how we could use to find , the value of the machine half a year after that point.

### 3 Fever Medicine

#### Student Task Statement

The graph shows the amount of medicine in a child’s body hours after taking the medicine. The amount of medicine decays exponentially.



1. After hour there are about 7 mg of medicine left. After hour there are about 3.5 mg of medicine left. About how many mg of medicine are left after 1 hours? Explain how you know.
2. How does the decay rate from hour to hour compare to the decay rate from hour to hour? Explain how you know.



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