7.1 Exponential Functions

\[ y = C^x \]

C is a constant, \( C > 0 \). \( x \) is the variable.

**Example 1**  \[ y = 2^x \]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-1</td>
<td>( \frac{1}{2} )</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>-2</td>
<td>( \frac{1}{4} )</td>
</tr>
</tbody>
</table>

Domain: \( x \in \mathbb{R} \)
Range: \( y > 0 \)
Asymptote: \( y = 0 \)
Increasing
\( y \)-intercept \( 1 \)

For \( y = C^x \), \( C > 1 \)
Always increasing
\( y \)-int = \( 1 \)
You sketch \( y = 4^x \)

**Ex 2**  \[ y = \left( \frac{1}{3} \right)^x \]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>( \frac{1}{3} )</td>
</tr>
<tr>
<td>-1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>( \frac{1}{9} )</td>
</tr>
<tr>
<td>-2</td>
<td>9</td>
</tr>
</tbody>
</table>

Domain: \( x \in \mathbb{R} \)
Range: \( y > 0 \)
\( y \)-intercept \( 1 \)
Decreasing

\( y = C^x \), \( 0 < C < 1 \)
Decreasing
\( y \)-int = \( 1 \)

Read Page 338. Do the your turn on pg 339.

\[ y = 5^x \]

Growth and Decay Formula

Radium 225 has a half-life of 15 days.

\[ C = \frac{1}{2} \Rightarrow A = A_0 \left( \frac{1}{2} \right)^{t/h} \]

\( A \) = amount left
\( A_0 \) = initial amount
\( C \) = growth or decay factor.

In this case: \( A = A_0 \left( \frac{1}{2} \right)^{t/15} \)
\[ A = A_0 \left(3^{t/T}\right) \]

Write the formula to calculate the amount of bacteria if it triples every week, where \(T\) is time in days.

Assignment pg 342 1-4 6,7 8a,c e9a,c,d