Mat 011 Agenda    Day 21: 3/11/02

3/11/02 Part 1

- Negative Exponents, Scientific Notation, S183
  PowerPoint Lecture 22

Homework: Topic 19, 20 pages S179, S187
Raising a Number to a Negative Power

\[ b^{-n} \text{ means } \frac{1}{b^n} \]
Raising a Number to a Negative Power

\[ b^{-n} \] means \( \frac{1}{b^n} \)

\[ b^{-n} = \frac{1}{b^n} = \frac{1}{b \cdot b \cdot b \cdot \ldots \cdot b} \]

\[ 3^{-4} \] means \( \frac{1}{3^4} \)

\[ 3^{-4} = \frac{1}{3^4} = \frac{1}{3 \cdot 3 \cdot 3 \cdot 3} = \frac{1}{81} = 0.012345 \]
$3^{-4} \quad 3^{(-4)} = .012345$

$\frac{1}{3^4} = \frac{1}{3.3333} = \frac{1}{81} = .012345$
\[
\frac{3^3}{3^7} = 3^{-4} = \frac{1}{3^4}
\]

\[
\frac{x^5}{x^2} = x^3
\]
Use of the calculator to evaluate an exponential expression.

To raise a number to a negative power use the $^\wedge$ key, and (-) key

$3^{-4}$ is keyed in as $3, ^\wedge, (-), 4, \text{ ENTER}$
<table>
<thead>
<tr>
<th>Expression</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \frac{1}{8^2} = \frac{1}{64} ]</td>
<td>0.015625</td>
</tr>
<tr>
<td>[-(\frac{-1}{64}) = \frac{-1}{1296} ]</td>
<td>-0.000771605</td>
</tr>
<tr>
<td>((-6)^4 =)</td>
<td>0.000771605</td>
</tr>
<tr>
<td>[ \frac{1}{0.085} = \frac{1}{0.085} ]</td>
<td>305175.7812</td>
</tr>
</tbody>
</table>
\[
\frac{6}{-2} = \frac{-6}{2} = -\frac{6}{2}
\]

\[
-3 = -3 = -3
\]
Find the monthly payments on a 48-month car loan of $18,000 at 3% annual interest.

\[ P = A \left( \frac{i}{1-(1+i)^{-n}} \right) \]

\[ \frac{.03}{12} = .0025 \]

\[ = 18,000 \left( \frac{.0025}{1-(1.0025)^{-48}} \right) \]

\[ = 18,000 \left( \frac{.0025}{1-(.8871)} \right) \]
\[
19,131 = 18,000 \left( \frac{0.0025}{1 - 0.8871} \right) \\
= 18,000 \left( \frac{0.0025}{0.1129} \right) \\
= 398.58
\]
Clintons can afford a $1000 monthly house payment at 7.2% annual interest rate for 360 months. How expensive a house can they afford?

\[
P = A \left[ \frac{i}{1-(1+i)^{-n}} \right]
\]

\[
\frac{.072}{12} = .006
\]

\[
1000 = A \left[ \frac{.006}{1-(1.006)^{-360}} \right]
\]

\[
1000 = A \left[ \frac{.006}{1-.116} \right]
\]
\[ 1000 = A \begin{bmatrix} .006 \\ .8839 \end{bmatrix} \]
\[ 1000 = A \begin{bmatrix} .00678 \end{bmatrix} \]
\[ \frac{.00678}{.00678} = \frac{147318.78}{A} \]
Scientific Notation

A number in Scientific Notation has the form $P \times 10^n$ where $1 \leq P < 10$ and $n$ is an integer.

$8,200,000 = \frac{6.27}{10^5} \times \frac{6.27}{10,000,000}$

$= 8.2 \times 10^6$

$= 6.27 \times 10^{-5}$
Scientific Notation

A number in Scientific Notation has the form $P \times 10^n$ where $1 \leq P < 10$ and $n$ is an integer.

$8,200,000 = 8.20 \times 10^6$
Scientific Notation

A number in Scientific Notation is written as $P \times 10^n$ where $1 \leq P < 10$.

$0.000517 = \boxed{5.17 \times 10^{-4}}$
Scientific Notation

A number in Scientific Notation has the form $P \times 10^n$ where $1 \leq P < 10$ and $n$ is an integer.

$0.000517 =$
Scientific Form to Decimal Form

A number in Scientific Notation has the form $P \times 10^n$ where $1 \leq P < 10$ and $n$ is an integer.

$7.3 \times 10^6$
Scientific Form to Decimal Form

A number in Scientific Notation has the form $P \times 10^n$ where $1 \leq P < 10$ and $n$ is an integer.

$3.141 \times 10^{-4}$

$0.0003141$
Scientific Notation

A number in Scientific Notation has the form \( P \times 10^n \) where \( 1 \leq P < 10 \) and \( n \) is an integer.

\[ 0.000517 = 5.17 \times 10^{-4} \]
<table>
<thead>
<tr>
<th>Scientific</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>$8.14 \times 10^3$</td>
<td>$8,140$</td>
</tr>
<tr>
<td>$4.18 \times 10^{-4}$</td>
<td>$.000418$</td>
</tr>
<tr>
<td>$7.86 \times 10^8$</td>
<td>$786,000,000$</td>
</tr>
<tr>
<td>$8.673 \times 10^{-10}$</td>
<td>$0.000000008,673$</td>
</tr>
<tr>
<td>$3.3 \times 10^{-2}$</td>
<td>$.033$</td>
</tr>
<tr>
<td>Decimal</td>
<td>Scientific</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>.0028</td>
<td>2.8 \times 10^{-3}</td>
</tr>
<tr>
<td>78,000</td>
<td>7.8 \times 10^4</td>
</tr>
<tr>
<td>.00000167</td>
<td>1.67 \times 10^{-6}</td>
</tr>
<tr>
<td>.000635</td>
<td>6.35 \times 10^{-4}</td>
</tr>
<tr>
<td>1,160,000</td>
<td>1.16 \times 10^6</td>
</tr>
<tr>
<td>Given</td>
<td>Changed Format</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>.0028</td>
<td></td>
</tr>
<tr>
<td>82000</td>
<td></td>
</tr>
<tr>
<td>8.14 x 10^3</td>
<td></td>
</tr>
<tr>
<td>4.18 x 10^{-4}</td>
<td></td>
</tr>
</tbody>
</table>
Use calculator to evaluate:

\[(6.3 \times 10^8)(4.2 \times 10^9)\]

To multiply a number in scientific notation use the EE key, 5th row, 2nd column.

\[2.646 \times 10^{18}\]

\[2.646 \times 18\] wrong

\[2.646 \times 10^{18}\] correct

\[2.6 \times 10^{18}\] wrong
Use calculator to evaluate: \((6.3 \times 10^8)(4.2 \times 10^9)\)

To multiply a number in scientific notation use the EE key,

5th row, 2nd column.

\((6.3 \times 10^8)(4.2 \times 10^9)\) is keyed in as 6.3, EE, 8, x, 4.2, EE, 9, Enter.