1a. What does the following Maple command do?

\[ f:=x->x^2+2*x-7; \]

b. After executing the command in Part a, what would the output for the following command be?

\[ f(3); \]

c. Give the Maple command that will graph \( f \) (from Part a still) over the range \(-2 \leq x \leq 3\).

d. If I asked you to use the graph of \( f \) to find a value for \( x \), accurate to 4 decimal places, that would make \( f(x) = 0 \), what would you do?

   a) Defines the function \( f(x) = x^2 + 2x - 7 \). b) 8. c) \texttt{plot(f(x), x=-2..3)}; d) Look for where the graph crossed the \( x \)-axis, and then regraph the function over smaller and smaller intervals, until it is clear which 4-digit number the graph crosses closest to.

2a. Think about the graphs of the power functions, \( x^2 \), \( x^3 \), \( x^4 \), etc. What is \( \lim_{n \to \infty} (0.8)^n \)?

b. What is \( \lim_{n \to \infty} (1.1)^n \)?

c. At some \( x \)-value \( x = a \) and some function \( f \), what are the coordinates of the point on the graph of \( f \) at \( x = a \)?

   a) 0. b) \( \infty \). c) \((a, f(a))\).
3a. (Lecture 02) For the function \( f(x) = x^2 \), we're looking at the slopes of the secants through \((-2, 4)\) and the points indicated in the table below. Fill in the table.

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y = f(x) )</th>
<th>slope of secant</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. What is the slope of the tangent line at \((-2, 4)\)?

\[ \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \]

\[ = \lim_{h \to 0} \frac{(x+h)^2 - x^2}{h} \]

\[ = \lim_{h \to 0} \frac{x^2 + 2xh + h^2 - x^2}{h} \]

\[ = \lim_{h \to 0} \frac{2xh + h^2}{h} \]

\[ = \lim_{h \to 0} (2x + h) \]

\[ = 2x \]

\[ = 4 \]

4. (Lecture 04)

a. \[ \lim_{x \to 2^+} \frac{-3}{x-2} \]

b. \[ \lim_{x \to 2^-} \frac{-3}{x-2} \]

c. \[ \lim_{x \to 5^-} \frac{-3}{x-2} \]

d. \[ \lim_{x \to -\infty} \frac{-3}{x-2} \]

e. \[ \lim_{x \to \infty} \frac{-3}{x-2} \]

a) \(-\infty\). b) \(\infty\). c) \(-\frac{3}{3} = -1\). d) \(-\frac{3}{\infty} = 0\). e) \(-\frac{3}{\infty} = 0\).

5. (Lecture 06)

a. The expression \( \frac{f(x+h) - f(x)}{h} \) is the \( \) through the points \( \) and \( \).

b. The expression \( \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \) is the \( \) through the point \( \).

c. When we derived the derivative for \( f(x) = x^7 \), we found

\[ m = \frac{(x + h)^7 - x^7}{h} = \frac{x^7 + \ldots + h^7 - x^7}{h} \]

(1)\[ \]

Fill in the question marks, and simplify.

d. Find the limit of expression in Part c as \( h \to 0 \).

e. What are the limits \( \lim_{h \to 0} \frac{\sin(h)}{h} \) and \( \lim_{h \to 0} \frac{1 - \cos(h)}{h} \), and what did we use them for?

a) slope of the secant line, \( (x, f(x)) \), and \((x + h, f(x + h))\). b) slope of the tangent line, \( (x, f(x)) \). c) \( 7x^6h \), and it all simplifies to \( m = 7x^6 + 21x^5h + 35x^4h^2 + \cdots + h^6 \). d) \( 7x^6 \). e) 1, 0, and we used them to derive the derivatives of \( \sin(x) \) and \( \cos(x) \).
6. (Lecture 07) Find the derivative of the following functions, using the formulas we have so far.

a. \( f(x) = x^8 \).

b. \( f(x) = x^{14} \).

c. \( f(x) = \frac{1}{x^3} = x^{-3} \).

d. \( f(x) = \sqrt[3]{x} = x^{1/3} \).

e. \( f(x) = x^{7/2} \).

\[ \begin{align*}
   a) \quad & f'(x) = 8x^7. \\
   b) \quad & f'(x) = 14x^{13}. \\
   c) \quad & f'(x) = -3x^{-4} \quad \left( = \frac{-3}{x^4} \right). \\
   d) \quad & f'(x) = \frac{1}{3}x^{-2/3} \quad \left( = \frac{1}{3\sqrt[3]{x^2}} \right). \\
   e) \quad & f'(x) = \frac{7}{2}x^{5/2} \quad \left( = \frac{7}{2}\sqrt{x^5} \right). 
\end{align*} \]