4.2 #2  Simplify the following:

(a) \( \left( \frac{1}{2} \right)^{-2} = \frac{1}{\left( \frac{1}{2} \right)^2} = \frac{1}{\frac{1}{4}} = 4 \)

(b) \( \left( e^{x+2} \right)^{-1} = \left( e^{x+2} \right)^{-1} = e^{-x-2} = \frac{1}{e^{x+2}} \)

(c) \( \left( \frac{e^x}{e^2} \right)^3 = \frac{e^{3x}}{e^6} = \frac{1}{e^{3x-6}} \)

(d) \( \frac{1}{e^3} = \frac{1}{\frac{1}{e^3}} = e^3 \)

---

**Compound Interest**  In Exercises 35–38, complete the table to determine the amount of money \( P \) that should be invested at rate \( r \) to produce a final balance of \( \$100,000 \) in \( t \) years.

<table>
<thead>
<tr>
<th>( t )</th>
<th>1</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P )</td>
<td>97044.55</td>
<td>74081.82</td>
<td>54881.16</td>
<td>40656.97</td>
<td>30119.42</td>
<td>22313.02</td>
</tr>
</tbody>
</table>

35. \( r = 4\% \), compounded continuously
36. \( r = 3\% \), compounded continuously

\[ A = Pe^{rt} \]
\[ 100,000 = Pe^{rt} \]
\[ \ln(100,000) = rt \]
\[ P = \frac{100,000}{e^{rt}} \]

---

4.3 #22  Find the line tangent to \( y = (e^{4x} - 2)^2 \) through (0, 1).

\( y = 2(e^{4x} - 2)e^{4x} \), \( y' = 8e^{4x}(e^{4x} - 2) \) at \( x = 0 \)

\( y' = -8 = \text{slope} \)

At slope \( y - y_1 = m(x - x_1) \rightarrow y - 1 = -8(x - 0) \rightarrow y = -8x + 1 \)

---

4.3 #34  Graph and analyze \( f(x) = xe^{-x} \). Find extrema and points of inflection.

\( f(x) = xe^{-x} \)
\( f'(x) = e^{-x} + (1-x)e^{-x} \)
\( f''(x) = -e^{-x} - (1-x)e^{-x} \)

Concave down on \((1, e)\)

Concave up on \((2, \infty)\)

Max at \( x = 1 \)

Inflexion at \( (3, e^3) \)