1 (total points: 13). Suppose that the graph of a linear function \( y = f(x) \) contains the points \((-2, 3)\) and \((4, 0)\).

(a) (5 points). Find the slope \( m \).

(b) (5 points). Find the vertical intercept \( b \).

(c) (3 points). Sketch the graph of \( f(x) \) on the given coordinate system.

2 (total points: 12). Values of a linear cost function in dollars are in the following table.

<table>
<thead>
<tr>
<th>( q )</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C(q) )</td>
<td>5000</td>
<td>5020</td>
<td>5040</td>
<td>5060</td>
<td>5080</td>
</tr>
</tbody>
</table>

(a) (6 points). Find a formula for the cost function.

(b) (6 points). Assume that the company sell the product at the price of 12 dollars per item. Find the break-even point.
3(total points: 13). The supply and demand curves for a certain product are given in terms of price, \( p \), by

\[ S(p) = 30p - 5000 \quad \text{and} \quad D(p) = 10000 - 20p. \]

(a)(5 points). Find the equilibrium price and quantity.

(b)(5 points). If a specific tax of $40 per unit is imposed on producers, find the new equilibrium price and quantity.

(c)(3 points). How much of the $40 tax is paid by the consumers, and how much by producers?

4(total points: 12). In each of the items (a)–(d), determine if the function is a power function. If it is a power function, write it in the form \( y = kx^p \) and give the values of the coefficient \( k \) and the exponent \( p \).

(a)(3 points). \( y = 5\sqrt{x} \).

(b)(3 points). \( y = 3 \cdot 4^x \).

(c)(3 points). \( y = \frac{1}{5x} \).

(d)(3 points). \( y = (2x^2)^3 \).
5(total points: 12). Solve the following equation for \( t \) (You should use your calculator to find a decimal approximation).

\[ 2 \cdot 3^t = 5 \cdot 2^t. \]

6(total points: 13). A cup of coffee contains 100 mg of caffeine, which leaves the body at a continuous rate of 17% per hour.

(a)(6 points). Write a formula for the amount, \( A \) mg, of caffeine in the body \( t \) hours after drinking a cup of coffee.

(b)(7 points). Use logarithms to find the half-life of the caffeine.
The following table gives partial data of a function $f(x)$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>50000</td>
<td>60000</td>
<td>72000</td>
<td>86400</td>
</tr>
</tbody>
</table>

Answer the following questions (You must show your work).

(a) **6 points**. Could the function $f(x)$ be linear or exponential?

(b) **6 points**. Find a formula for the function.

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Let $f(x) = x^3 - 1$ and $g(x) = x + 1$. Find the following (no need for simplification).

(a) **5 points**. $f(g(x))$

(b) **4 points**. $g(f(x))$

(c) **3 points**. $f(f(x))$. 