1. Sketch the graph of the equation $y = x^2 - 6x$ by reflecting, horizontally translating and vertically translating the graph of $y = x^2$ appropriately. Write the equations for each of the two or three steps in the process of rigidly transforming the graph of $y = x^2$ (shown below). You may wish to sketch graphs of each of the equations you write.

Steps:
0) $y = x^2$

1) 

2) 

3) 

<table>
<thead>
<tr>
<th>Prob.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
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<td>16</td>
<td>8</td>
<td>15</td>
<td>12</td>
<td>15</td>
<td>14</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

![Graph of $y = x^2$](image)
2. Find each of the following limits. SHOW ALL WORK.

(a) \( \lim_{x \to 2} \frac{2x - 4}{x^4 - 4x^2} \)

(b) \( \lim_{t \to -2} \frac{t^2 - 4}{6t^2 - 14t + 4} \)

(c) \( \lim_{t \to \infty} \sqrt{2 + 3t - 7t^2} \frac{1}{8t^2 + 1} \)

(d) \( \lim_{x \to -\infty} \frac{1 - x}{\sqrt{4x^2 + 9}} \)
3. Find each of the following limits. SHOW ALL WORK.

(a) \( \lim_{x \to \infty} \cos \left( \frac{\sqrt{x}}{x} \right) \)

(b) \( \lim_{t \to 0} \frac{(2t)^2}{1 - \cos^2 t} \)

4. Use the graphs of \( f \) and \( g \) in the accompanying figure to find the values that exist.

(a) \( \lim_{x \to 2} [f(x) + g(x)] \)

(b) \( f(2) + g(1) \)

(c) \( \lim_{x \to 1} \frac{g(x)}{f(x)} \)

(d) \( \lim_{x \to 2} x^3 f(x) \)

(e) \( \lim_{x \to -1} \sqrt{1 + f(x)} \)
5. Find the values of the constants $k$ and $m$, if possible, that will make the function $g$ continuous at $x = 0$

$$g(x) = \begin{cases} 
\frac{kx}{x^2 - 2x}, & x < 0 \\
m, & x = 0 \\
\frac{x^2 + kx + \sin x}{2x}, & x > 0 
\end{cases}$$

Recall, we have just one definition of continuity: $f$ is continuous at $x = a$ iff $\lim_{x \to a} f(x) = f(a)$
6. Use the graph of the function $f$ shown below to answer the questions.

(a) Find the average rate of change of $y$ with respect to $x$ over the interval $[0,4]$.

(b) Find the average rate of change of $y$ with respect to $x$ over the interval $[0,2]$.

(c) Arrange the numbers $f'(-2)$, $f'(-1)$, $f'(3)$ in increasing order (you do not have to estimate these values).

(d) Arrange the numbers $f'(-1)$, $f'(1)$, $f'(2)$ in increasing order (you do not have to estimate these values).

(e) Find the value of $f'(-3)$.
7. Using the definition of the derivative, find the derivative of \( s(t) = t - \frac{3}{2}t^2 \). Show all steps (i.e. start with \( s'(t) = \ldots \)).

8. Find an equation for the line tangent to the graph of the function \( f(x) = x - \frac{3}{2}x^2 \) at \( x = 2 \).