Find the area of the region.

\[ f(x) = x^2 + 6x + 9 \]
\[ g(x) = 6x + 25 \]
2. Find the area of the region.
   \[ f(x) = (x - 5)^3 \]
   \[ g(x) = x - 5 \]

3. Sketch and shade the region bounded by the graphs of the functions.
   \[ y = 12 - x^2, \quad y = x^2 \]
4. Question Details

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

**Tutorial Exercise**

Find the consumer and producer surpluses by using the demand and supply functions, where \( p \) is the price (in dollars) and \( x \) is the number of units (in millions).

<table>
<thead>
<tr>
<th>Demand Function</th>
<th>Supply Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>( p = 330 - x )</td>
<td>( p = 130 + x )</td>
</tr>
</tbody>
</table>

5. Question Details

An epidemic was spreading such that \( t \) weeks after its outbreak the rate of infection was

\[
N_1(t) = 0.1t^2 + 0.8t + 150, \quad 0 \leq t \leq 50
\]

people per week. Twenty-five weeks after the outbreak, a vaccine was developed and administered to the public. At that point, the rate of infection of people per week was governed by the model

\[
N_2(t) = -0.2t^2 + 5.7t + 215.
\]

Approximate the number of people that the vaccine prevented from becoming ill during the epidemic. (Round your answer to the nearest integer.)


6. Question Details

Use the rectangles to approximate the area of the region. (Round your answer to three decimal places.)

\[ f(x) = 81 - x^2, \quad [-9, 9] \]

Give the exact area obtained using a definite integral.
Use the Midpoint Rule with $n = 5$ to approximate the area of the region bounded by the graph of $f$ and the $x$-axis over the interval. (Round your answer to three decimal places.)

Function $f(x) = 64 - x^2$  
Interval $[-1, 0]$

Sketch the region.
Use the Midpoint Rule with $n = 4$ to approximate the area of the region bounded by the graph of $f$ and the $x$-axis over the interval. (Round your answer to four decimal places.)

<table>
<thead>
<tr>
<th>Function</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x) = x^6 - x^7$</td>
<td>[0, 1]</td>
</tr>
</tbody>
</table>

Sketch the region.
Use the Midpoint Rule to estimate the surface area of the pond shown in the figure, where \( x = 10 \). (Round your answer to the nearest integer.)

\[ \text{ft}^2 \]

Let \( f \) be continuous on \([a, b]\) and let \( n \) be the number of equal subintervals (see figure). Then the Trapezoidal Rule for approximating \( \int_a^b f(x) \, dx \) is as follows.

\[
\frac{b-a}{2n} [f(x_0) + 2f(x_1) + \ldots + 2f(x_{n-1}) + f(x_n)]
\]

Consider the following definite integral.

\[
\int_1^9 \frac{1}{x^2} \, dx
\]

Use the Trapezoidal Rule with \( n = 8 \) to approximate the definite integral. (Round your answer to three decimal places.)

Use the Midpoint Rule with \( n = 8 \) to approximate the definite integral. (Round your answer to three decimal places.)

Find the exact area obtained with a definite integral. (Round your answer to three decimal places.)

Which approximation technique appears to be better?

- The Trapezoidal Rule is a better approximation than the Midpoint Rule.
- The Midpoint Rule is a better approximation than the Trapezoidal Rule.
- The Midpoint Rule gives the same approximation as the Trapezoidal Rule.

Find the volume of the solid formed by revolving the region bounded by the graph(s) of the equation(s) about the \( x \)-axis.

\[ y = x, \ y = e^{x-1}, \ x = 0 \]

Rounded to three decimal places =
Find the volume of the solid formed by revolving the region bounded by the graph(s) of the equation(s) about the $y$-axis.

$x = y(y-1), x=0$  
Rounded to three decimal places =