1. We set \( f(x) = g(x) \) to find that the graphs intersect at \( x = -2 \) and \( x = 3 \).

\[
\text{Area} = \int_{-2}^{3} \left( (x + 4) - (x^2 - 2) \right) \, dx
\]

\[
= \int_{-2}^{3} (-x^2 + x + 6) \, dx
\]

\[
= \left[ -\frac{1}{3}x^3 + \frac{1}{2}x^2 + 6x \right]_{-2}^{3}
\]

\[
= \left( -\frac{9}{2} + 18 \right) - \left( \frac{8}{3} + 2 - 12 \right)
\]

\[
= \frac{125}{6}
\]

2. From the graph, it should be clear that the definite integral is negative so the only possible correct answer is (e).

3. (a)

\[
\text{Area} = \int_{0}^{2} e^y \, dy
\]

\[
= [e^y]_{0}^{2}
\]

\[
= e^2 - 1
\]

Three alternate approaches lead to the following correctly set up integrals. We will discuss these in class.

- \( \text{Area} = \int_{0}^{1} 2 \, dx + \int_{1}^{e^2} (2 - \ln x) \, dx \)
- \( \text{Area} = 2 + \int_{1}^{e^2} (2 - \ln x) \, dx \)
- \( \text{Area} = 2e^2 - \int_{1}^{e^2} \ln x \, dx \)
(b)

\[ Volume = \int_0^2 \pi (e^y)^2 \, dy \]
\[ = \int_0^2 \pi e^{2y} \, dy \]
\[ = \left[ \frac{\pi e^{2y}}{2} \right]_0^2 \]
\[ = \frac{\pi e^4}{2} - \frac{\pi}{2} \]

Three alternate approaches lead to the following correctly set up integrals. We will discuss these in class.

• \( Volume = \int_0^1 2\pi x(2) \, dx + \int_1^e 2\pi x(2 - \ln x) \, dx \)
• \( Volume = 2\pi + \int_1^e 2\pi x(2 - \ln x) \, dx \)
• \( Volume = 2\pi e^4 - \int_1^e 2\pi x \ln x \, dx \)

(c)

\[ Volume = \int_0^2 2\pi ye^y \, dy \]

Three alternate approaches lead to the following correctly set up integrals. We will discuss these in class.

• \( Volume = \int_0^1 \pi (2)^2 \, dx + \int_1^e \left( \pi (2)^2 - \pi (\ln x)^2 \right) \, dx \)
• \( Volume = 4\pi + \int_1^e \left( \pi (2)^2 - \pi (\ln x)^2 \right) \, dx \)
• \( Volume = 4\pi e^2 - \int_1^e \pi (\ln x)^2 \, dx \)