


DATE: _____


Evaluate the following integrals. Check your answer in your graphing calculator.

1. $\int_1^{e^4} \frac{4}{r} dr$  4

$$\begin{aligned}
 &= 4 \int_1^{e^4} \frac{1}{r} dr \\
 &= (4 \ln|r|) \Big|_1^{e^4} \\
 &= 4 \ln|e^4| - 4 \ln|1| \\
 &= 4 \ln e - 4(0) \\
 &= 4(1) - 0 \\
 &= \boxed{4}
 \end{aligned}$$

4. $\int_3^4 (y^2 - 9) dy$  3.333


$$\begin{aligned}
 &= \left(\frac{1}{3} y^3 - 9y \right) \Big|_3^4 \\
 &= \frac{1}{3} (4)^3 - 9(4) - \left(\frac{1}{3} (3)^3 - 9(3) \right) \\
 &= \frac{64}{3} - 36 - \frac{27}{3} + 27 \\
 &= \frac{37}{3} - 9 \\
 &= \frac{37}{3} - \frac{27}{3} \\
 &= \boxed{\frac{10}{3}}
 \end{aligned}$$

2. $\int_0^1 (x + e^x) dx$  2.218


$$\begin{aligned}
 &= \left(\frac{1}{2} x^2 + e^x \right) \Big|_0^1 \\
 &= \frac{1}{2} (1)^2 + e^1 - \left(\frac{1}{2} (0)^2 + e^0 \right) \\
 &= \frac{1}{2} + e - 0 - 1 \\
 &= \boxed{e - \frac{1}{2}}
 \end{aligned}$$

5. $\int_1^4 x\sqrt{x} dx$  12.4

$$\begin{aligned}
 &= \int_1^4 x \cdot x^{1/2} dx \\
 &= \int_1^4 x^{3/2} dx \\
 &= \frac{2}{5} x^{5/2} \Big|_1^4 \\
 &= \frac{2}{5} (4^{5/2} - 1^{5/2}) \\
 &= \frac{2}{5} ((\sqrt{4})^5 - 1) \\
 &= \frac{2}{5} (32 - 1) \Rightarrow \frac{2}{5} (31) = \frac{62}{5}
 \end{aligned}$$

3. $\int_0^{\pi/4} (8 \cos \theta) d\theta$  5.657

$$\begin{aligned}
 &= 8 \int_0^{\pi/4} \cos \theta d\theta \\
 &= 8 \sin \theta \Big|_0^{\pi/4} \\
 &= 8 (\sin \pi/4 - \sin 0) \\
 &= 8 \left(\frac{\sqrt{2}}{2} - 0 \right) \\
 &= 4\sqrt{2}
 \end{aligned}$$

6. $\int_1^2 \left(u + \frac{1}{u^2} \right) du$  2

$$\begin{aligned}
 &= \int_1^2 (u + u^{-2}) du \\
 &= \left(\frac{1}{2} u^2 - u^{-1} \right) \Big|_1^2 \\
 &= \frac{1}{2} (2)^2 - 2^{-1} - \left(\frac{1}{2} (1)^2 - 1^{-1} \right) \\
 &= 2 - \frac{1}{2} - \frac{1}{2} + 1 \\
 &= 2
 \end{aligned}$$