

Name: Solutions**Problem 1** Use the Midpoint Rule with five subintervals to approximate the integral $\int_0^1 e^{-x^2} dx$.

$$0.2 \left(e^{-0.1^2} + e^{-0.3^2} + e^{-0.5^2} + e^{-0.7^2} + e^{-0.9^2} \right) =$$

$$\underline{0.74805325}$$

Problem 2 Compute $\int_1^2 \frac{t+5t^7}{t^3} dt$.

$$\int_1^2 (t^{-2} + 5t^4) dt = \left(-t^{-1} + t^5 \right) \Big|_1^2$$

$$= \left(-\frac{1}{2} + 2^5 \right) - \left(-\frac{1}{1} + 1^5 \right) = \underline{31.5}$$

Problem 3 Compute $\frac{d}{dx} \int_1^{\ln x} t e^t dt$.

$$\frac{d}{du} \int_1^u t e^t dt = u e^u = \ln x \cdot e^{\ln x} = x \ln x$$

$$\frac{d}{dx} \int_1^{\ln x} t e^t dt = x \cdot \ln x \cdot \frac{du}{dx} = x \cdot \ln x \cdot \frac{1}{x} = \boxed{\ln x}$$