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Show all work to receive full credit. Supply explanations when necessary.

1. (3 points) Integrate: $\int\left(x^{2}+8\right) e^{3 x} d x$
2. (4 points) Evaluate the definite integral: $\int_{1}^{2} x^{3} \ln x d x$
3. (3 points) Integrate: $\int \sin ^{5} x \cos ^{3} x d x$
