

1. (48 pts) Find the following indefinite integrals.

(a) $\int \sin^3 x \cos^3 x \, dx$

(b) $\int \frac{x^2 - 4x + 3}{(x - 2)^3} \, dx$

(c) $\int \frac{4x^2 + 14x + 14}{(x + 1)(x^2 + 4x + 5)} \, dx$

(d) $\int \frac{x^3}{\sqrt{x^2 + 9}} \, dx$

2. (32 pts) Find the following definite integrals.

(a) $\int_0^{\sqrt{2}} \sqrt{4 - x^2} \, dx$

(b) $\int_0^2 x^3 \ln x \, dx$

3. (20 pts) Find the following limits, using L'Hôpital's rule as necessary.

(a) $\lim_{x \rightarrow \infty} \frac{1 - 3x^2}{3 - 4x^2}$

(b) $\lim_{x \rightarrow 0} \frac{x - \sin x}{1 - \cos x}$