

## Math 142, Final, Part2, Practice Problems

---

1. Evaluate  $\int \frac{x-9}{(x+5)(x-2)} dx$ .

**Ans.**  $2 \ln |x + 5| - \ln |x - 2| + C$

2. Evaluate  $\int \frac{x+4}{x^2+2x+5} dx$ .

**Ans.**  $\frac{1}{2} \ln(x^2 + 2x + 5) + \frac{3}{2} \tan^{-1}\left(\frac{x+1}{2}\right) + c$

3. Evaluate  $\int \frac{5x^2+3x-2}{x^3+2x^2} dx$ .

**Ans.**  $2 \ln |x| + 3 \ln |x + 2| + \frac{1}{x} + c$

4. Find the approximations  $T_4$ ,  $M_4$ , and  $S_4$  for the integral  $\int_0^4 e^{-\sqrt{x}} dx$ .

**Ans.**  $T_4 = 1.35559$ ,  $M_4 = 1.14664$ ,  $S_4 = 1.26692$

5. Evaluate the improper integral  $\int_0^\infty \frac{x}{1+x^2} dx$ .

**Ans.**  $\infty$

6. Evaluate the improper integral  $\int_0^1 \frac{\ln x}{\sqrt{x}} dx$ .

**Ans.**  $-4$

7. Find the length of the curve  $y = \frac{x^5}{6} + \frac{1}{10x^3}$ ,  $1 \leq x \leq 2$ .

**Ans.**  $\frac{1261}{240}$

8. Find the length of the curve  $y = \ln(\sec x)$ ,  $0 \leq x \leq \pi/4$ .

**Ans.**  $\ln(\sqrt{2} + 1)$

9. Find the center of the region bounded by  $y = \cos x$ ,  $y = 0$ ,  $x = 0$ ,  $x = \frac{\pi}{2}$ .

**Ans.**  $\left(\frac{\pi}{2} - 1, \frac{\pi}{8}\right)$

10. Find the center of the region bounded by  $y = \sqrt{x}$ ,  $y = x$ .

**Ans.**  $\left(\frac{2}{5}, \frac{1}{2}\right)$