

1. (34 pts) Evaluate the integral.

(a) $\int \sin^3 \theta \, d\theta$ (b) $\int 2x \arctan x \, dx$ (c) $\int \frac{dx}{(x^2 - 1)^{3/2}}$

2. (22 pts) Consider the integral $I = \int_k^\infty \frac{5}{x^2 - 5x} \, dx$, where k is a constant.

(a) First evaluate $\int \frac{5}{x^2 - 5x} \, dx$. Express your answer in terms of a single logarithm.

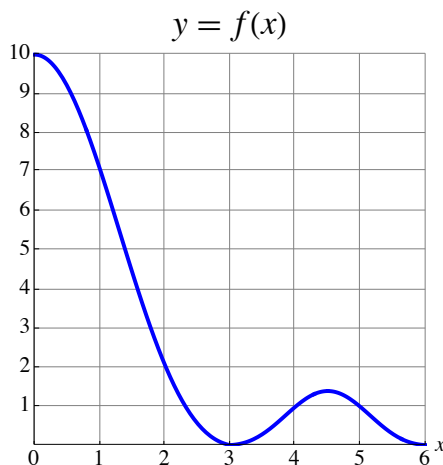
(b) Next evaluate the integral I for $k = 7$.

(c) For what values of k (if any) will the integral I converge? Justify your answer.

3. (20 pts)

(a) Shown below is a graph of continuous function $f(x)$ on $[0, 6]$. Find the approximations

T_3 and M_3 for the integral $\int_0^6 f(x) \, dx$.



(b) Suppose T_8 is used to approximate $\int_0^8 g(x) \, dx$, and $g''(x) = -\frac{3 \sin^2(x) + 5 \cos(x)}{(x + 4)^3}$.

Estimate the error for the approximation. Simplify your answer.

4. (24 pts) Consider the region bounded by the curves $x = 2 \ln y$ and $y = e^{\sqrt{x}}$. Set up (but do not evaluate) integrals to find the following quantities.

(a) The area of the region.

(b) The volume of the solid generated by rotating the region about the specified line. Use the disk/washer method.

i. About the y -axis

ii. About the line $y = -3$

END OF TEST