

MATH 142 Exam 1**Name**
Section Id

Put the question number (including its sub-problem number, if any) for each problem on your answer sheet. Put a box around the final answer to a question.

For full credit you must *show your work*. You must have enough written work, including explanations when called for, to justify your answers. Incomplete solutions may receive partial credit if you have written down a reasonable partial solution.

1 [15P] Evaluate the indefinite integrals

a. $\int \frac{dx}{x - \pi}$

b. $\int \frac{x}{1 + x^2} dx$

c. $\int \tan x dx$

2. Assume that $[x_{i-1}, x_i]$ denotes the i^{th} subinterval of a subdivision of $[0, 3]$, which is divided into n subintervals having the same length $\Delta x = \frac{3}{n}$.

a [5P] Write down a Riemann sum R_n for the definite integral $\int_0^3 \frac{dx}{x}$

b [5P] Give an integral (but do not evaluate it) that is approximated by the Riemann sum

$$\sum_{i=1}^n e^{3x} \cdot \frac{3}{n}$$

3 [10P] Find the derivative.

a. $\frac{d}{dt} \ln(t+5)^2$

b. $\frac{d}{dx} 5^{(x^2)}$

4 [15P] Evaluate the integrals a. $\int \cos(2x + 7)dx$.

b. $\int_1^{\sqrt{3}} \tan^{-1} x dx$ c. $\int x e^{2x} dx$

5 [10P] Find an integral expressing the total area of the bounded region between $y = x$ and the graph of the function $y = x^3$. Do *not* evaluate the integral.

6 [15P] Use either the method of disk/washer or the method of cylindrical shells to express as an integral the volume of the solid generated by revolving around the y -axis the region bounded by $y = x^2$ and $y = \sqrt{x}$. Do *not* evaluate the integral.

7 [15P] Find the work done by the force $F(x) = \frac{10}{1+x^2}$ in moving a particle along the x -axis from $x = 0$ to $x = 7$.

8 [10P] Let L be the arc length of the curve

$$y = \frac{2}{x^4} + \frac{x^4}{2} \quad \text{from } x = 0.5 \quad \text{to } x = 3 .$$

Express L as an integral. You do NOT have to evaluate the integral.