Exam 2 **Name**
Math 142 **Section** **Id**

Use exactly one page for each of the six numbered questions (use the back of the page if necessary).
Put a box around the final answer to a question.
You must *show* your work in order to get possible credits.

1 [20 pts] Evaluate the integral

a) $\int x \sin(2x)\, dx$

b) $\int x^2 \ln x\, dx$

2 [10 pts] Find the following limits:

$$(a) \quad \lim_{x \to 0} \frac{\tan^{-1} x}{x}$$

$$(b) \quad \lim_{x \to +\infty} \frac{5x}{100 + \ln x}$$

3 [20 pts] Evaluate the trigonometric integrals:

a) $\int_{-\pi/4}^{\pi/4} \tan x \, dx$

b) $\int_{-\pi/4}^{\pi/4} \sec(x) \tan^3(x) dx$

4 [20 pts] Use partial fractions to decompose the rational function $P(x)/Q(x)$ as is the integrand, then evaluate the integral.

a)

$$\int \frac{x}{x^3+1}dx$$

Hint: $x^3+1=(x+1)(x^2-x+1)$

b)

$$\int \frac{du}{u(u-2)(u+2)}$$

5 [15 pts] Determine whether the improper integral converges. If it does, find the value of the integral:

$$(a) \quad \int_0^\infty e^{-2x}\,dx$$

$$(b) \quad \int_2^\infty \frac{100}{x^{1.1}}\,dx$$

$$(c) \quad \int_0^1 \frac{1}{x\ln x}\,dx$$

6 [15 points] Give an integral expression of the volume V of the solid generated by revolving the region R around the x-axis, where R is enclosed by the line $x = 2$, the x-axis and the curve

$$y = \frac{1}{\sqrt{x}}, \qquad 2 \leq x < \infty.$$

Do you think whether the solid has a finite volume or not? Explain why.