Name: _____

Math 142-12 (Tully-Doyle) **Exam 2** **February 20, 2026**

Note: You may leave arithmetic and trigonometric quantities unsimplified after integrating. No notes. No calculators. No outside help. Show work for complete credit.

Question	Points	Score
1	10	
2	20	
3	5	
4	5	
5	10	
Total:	50	

1. (10 points) Evaluate the following limits

(a)

$$\lim_{x \to \pi/2^+} \frac{\cos x}{1 + \sin x}$$

(b)

$$\lim_{x \to \infty} (\ln x - 2x)$$

2. (20 points) Evaluate the integrals:

(a)

$$\int \frac{1}{(x^2-9)^{3/2}}\,dx$$

(b)

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

(c)

$$\int 3\tan^3 x \sec^3 x \, dx$$

(d)

$$\int e^{2x} \sin(x) \, dx$$

3. (5 points) Determine if the integral converges or diverges. If it converges, find the limit.

$$\int_2^\infty \frac{1}{x(\ln x)^2}\, dx$$

4. (5 points) Suppose you have already correctly evaluated an indefinite integral using the substitution $x = 4\cot\theta$. Please answer the following questions. Simplify as much as possible.

   (a) What does θ equal? (Write your answer in the form of $\theta =$ something.)

   (b) What does $\sec(\theta)$ equal?

   (c) What does $\sin(2\theta)$ equal?

5. (10 points) (a) Find the partial fraction decomposition of

$$f(x) = \frac{4}{x^2 + 6x + 8}.$$

(b) Compute, using your result from the previous part,

$$\int_5^\infty f(x)\, dx.$$

(For partial credit, if you did not complete the first part, use the decomposition $f(x) = \frac{1}{x+3} - \frac{1}{x+1}$.)