Name: _____

Math 142-12 (Tully-Doyle) **Exam 2** **March 8, 2023**

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1. (25 points) Evaluate the integrals:

   (a)

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

   (b)

$$\int \frac{1}{(x^2+4)^{3/2}} \, dx$$

(c)

$$\int_0^{\pi/3} \sin^2 t \cos^5 t \, dt$$

(d)

$$\int_3^5 \frac{1}{(x-4)^2} \, dx$$

(e)

$$\int e^x \cos(4x)\, dx$$

2. (5 points) Suppose you have already correctly evaluated an indefinite integral using the substitution $x = 3\sec\theta$. 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 $\tan(\theta)$ equal?

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

3. (10 points) (a) Find the partial fraction decomposition of

$$f(x) = \frac{5x^2 + x + 11}{(x+1)(x^2+4)}.$$

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

$$\int f(x)\,dx.$$

(For partial credit, if you did not complete the first part, use the decomposition $f(x) = \frac{2}{x-2} + \frac{3x+1}{x^2+9}$.)

4. (10 points) Evaluate the following limits

(a)

$$\lim_{x\to\infty} x\sin(\frac{\pi}{x})$$

(b)

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

Question	Points	Score
1	25	
2	5	
3	10	
4	10	
Total:	50	