Name: _____

Math 142 (Tully-Doyle) **Exam 1** **April 21, 2026**

Question	Points	Score
1	8	
2	8	
3	6	
4	10	
5	8	
Total:	40	

a

1. (8 points) Evaluate the integrals:

(a)

$$\int 2z^2 e^{z^3+1}\, dz$$

(b)

$$\int_1^e \frac{(\ln x)^3}{x}\, dx$$

a

2. (8 points) Consider the region bounded by the curves $y = 0$ and $y = (1 - x)(3 + x)$. Draw the region.

(a) Set up but do not evaluate an integral computing the volume of the solid obtained by rotating the region about the line $x = 2$. Draw a typical cross-section and give its volume.

(b) Set up but do not evaluate the integral to compute the volume of solid obtained by rotating the region about $y = -2$. Draw a typical cross-section and give its volume.

a

3. (6 points) Sketch the region enclosed between the curves $y = x^2$ and $y = x$ for x-values between $x = 0$ and $x = 2$. Label any points of intersection. Find the area of the region.

a

4. (10 points) A tank in the shape of an inverted cone sitting on the ground (that is, the point is sticking up) has height 8m and base radius of 6m. Water is in the tank to a height of 4m. Sketch the problem. Label a coordinate system. Draw a typical slab. Fully set up an integral to find the work required to empty the tank through the spout. (You can use a water density of $\rho = 1000kg/m^3$ and $g = 10\ m/s^2$.)

a

5. (8 points) Compute the derivatives.

(a)

$$f(x) = x^{\sqrt{x}}, \quad x > 0.$$

(b)

$$g(x) = \ln\left(\frac{(x+2)^2}{(x+3)^3(x-1)^2}\right), \quad x > 1$$

a