Name: _____

Math 142-12 (Tully-Doyle) **Exam 1** **December 3, 2021**

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1. (10 points) Evaluate the integrals:

   (a)

$$\int \frac{z^2}{\sqrt[3]{1+z^3}}\,dz$$

   (b)

$$\int_1^2 \frac{e^{1/x}}{x^2}\,dx$$

2. (15 points) Consider the region bounded by the curves $y = x^2, y = 2 - x^2, x \geq 0$.

(a) Set up **but do not evaluate** an integral to compute the area of the region.

(b) Set up **but do not evaluate** an integral to compute the volume of solid obtained by rotating the region about the x-axis.

(c) Set up **but do not evaluate** an integral to compute the volume of the solid obtained by rotating the region about the axis $x = 3$.

3. (5 points) Sketch the region enclosed between $y = 2\sin x$ and $y = 2\cos x$ between $x = 0$ and $x = 2\pi$. Find the area of the region.

4. (5 points) A 50m chain of mass 200kg hangs off the side of a tall building.
   (a) How much work does it take to pull the chain to the top of the building?

   (b) (**BONUS**) Suppose there is a 50kg bucket at the end of the same chain. How much work does it take to lift the bucket and chain halfway up (i.e. lift the bucket 25m)?

5. (10 points) (a) Find an equation of the tangent line to the curve

$$ye^{\sin \pi x} + xe^{y} = 1$$

at the point $(0, 1)$.

(b) Find the solutions to the equation

$$2e^{2x} + 5e^{x} - 3 = 0.$$

Question	Points	Score
1	10	
2	15	
3	5	
4	5	
5	10	
Total:	45	