Math 112 EXAM I, Spring 2022

Read each problem carefully. Show all your work for each problem! No Calculators!

1. (10) Find the length of the curve $y = \frac{1}{6}(2 + 4x^2)^{3/2}$ over $0 \le x \le 3$.

2. (10) The region between the curve $y = e^x + e^{-x}$, $\quad -1 \le x \le 1$, and the x-axis is revolved about the x-axis to generate a solid. Find its volume.

3. (a) (5) Find the derivative
$$y = x \ln(\cosh 2x).$$

   (b) (5) Evaluate the integral
$$\int_0^{\ln 2} \left(2e^x \cosh(x) - e^{2x} \right) \, dx$$

4. (10) A force of $F = \frac{x}{\sqrt{x^2+9}}$ lbs is applied to move an object along the x-axis from $x = 0$ to $x = 4$ft. Determine the amount of work done.

5. (12) The region enclosed by the curves $y = x + 2$, $y = -x + 2$ and $x = 3$ is revolved about the line $x = 6$ to generate a solid. Find the volume using the shell method.

6. (12) Find the area of the surface formed by rotating the curve $y = \sqrt{6x - x^2}$ for $1 \le x \le 3$ about the x-axis.

7. (12) The base of a solid is the region bounded by the curves, $y = \sqrt{x}$, $y = 0$ and $x = 4$. The cross-sections perpendicular to the x-axis are squares. Find the volume of this solid.

8. (12) A tank is constructed by revolving the curve $y = 6x^2$ for $0 \le x \le 1$ about the y-axis. The tank is filled with fluid weighing 20 lb/ft^3. How much work is done in pumping all the fluid to a level 2 ft above the rim of the tank?

9. (12) A 20 lb bucket is lifted from the ground into the air by pulling in L feet of cable. The cable weighs 4 lb/ft. If 400 ft· lbs of work are done lifting both the bucket and cable, what is the length of the cable, L?