Math 112 EXAM I, September 25, 2019

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

1. (12) Find the length of the curve $y = \frac{x^3}{6} + \frac{1}{2x}$ over $1 \leq x \leq 3$.
2. (12) A spring has a natural length of 1 meter. A force of 10N stretches the spring to 1.1 meters (i.e. 1/10 meter beyond its natural length). How much work is done when compressing the spring from 1 meter to 0.5 meters?
3. (12) The region between the curves $y = e^x$, $y = 0$, $x = 0$ and $x = 1$ is revolved about the x-axis to generate a solid. Find its volume.
4. (12) A 40-ft length of cable hangs from the edge of a tall building. How much work will it take to pull the rope to the top of the building if it weighs 2 lb/ft?
5. (13) Use the shell method to find the volume of the solid generated by revolving the region bounded by $y = x^4$ and $y = 8x$ about the y-axis.
6. (13) The region between the curves $y = \sqrt{x}$, $y = 0$, and $x = 4$ is revolved about the line $y = -1$ to generate a solid. Find its volume.
7. (13) Find the area of a surface generated by revolving the curve $y = \sqrt{4x - x^2}$, for $0 \leq x \leq 3$, about the x-axis.
8. (13) The base of a solid is the region bounded by the curves $y = 2x$, $y = 4$, and $x = 0$. The cross-sections perpendicular to the x-axis are squares whose bases run between the curves $y = 2x$ and $y = 4$. Find the volume of this solid.