MA 241 Test 1 Version 1

Name: _____

(Please print your first and last name neatly)

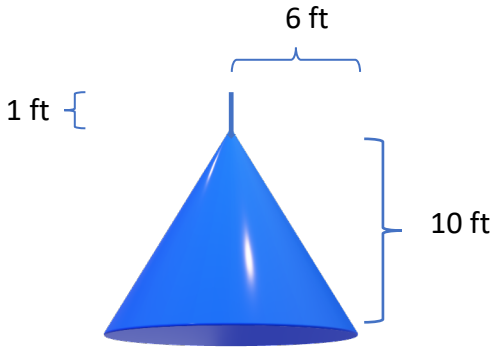
1. (14 points) Find the average value of f(x)= $x\cos(2x)$ from $0 \leq x \leq \frac{\pi}{4}$

2. (14 points) Assuming 30 J of work is needed to stretch a spring from its natural length of 400 cm to a length of 500 cm, find the work needed to stretch the spring from 500 cm to 600 cm. Include units with your answer.

3. (14 points) Find the centroid of the lamina in the first quadrant bounded by $y=\frac{1}{x}$, x=1, x=3, and the x-axis.

You may need some of the following:
density of water $= 1000\ kg/m^3$
weight density of water $= 62.4\ lb/ft^3$
gravity $= 9.8\ m/s^2$
gravity $= 32\ ft/s^2$

4. (15 points) A tank has the shape of a circular cone with a height of 10 ft and a base radius of 6 ft. **It is filled with water to a height of 8 ft**. Set up the integral needed to find the work required to pump all the water out of a spout located 1ft spout above the tank. Your answer should include units and a picture with locations of the x and y axes.



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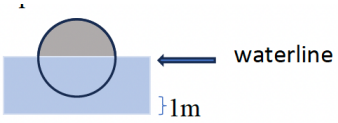
gravity $= 9.8\ m/s^2$
gravity $= 32\ ft/s^2$

5. (15 points) Set up the integral to find the hydrostatic force on the submerged semicircular region with radius 2m shown below. Your answer should include units and a picture with locations of the x and y axes.



6. (14 points) A 100 ft rope weighing 20 pounds hangs over the edge of a tall cliff. Find the work needed to pull the rope to the top of the cliff.

7. (14 points) Find the length of the curve given by $x = e^t - t,\ y = 4e^{(t/2)}$, $0 \leq t \leq 2$.