

### Quiz 3 Solution - Math 166

Name: \_\_\_\_\_

Show all work to receive maximum credit for each problem. You may not use your book, notes, or a calculator on this quiz. Give exact answers, not decimal approximations. Do not give answers as mixed fractions. This quiz is worth 20 points.

1. (5 points) A force is being applied to an object moving along the x-axis. Suppose that the force applied to the object at the point  $x$  is given by  $F(x) = -3\sin(\pi x)$ . Find the amount of work done on the object between the points  $x = 1$  and  $x = 2$ .

$$\text{Solution: } W = \int_1^2 -3\cos(\pi x) dx = \frac{6}{\pi}$$

2. (5 points) Masses of 1, 3, 2, and 5 kilograms are located at points 0, 1, 3, and 4, respectively, along the x-axis. Find the center of mass.

$$\text{Solution: } \bar{x} = \frac{29}{11}$$

3. (5 points) A straight wire 4 units long has density  $\delta(x) = \sqrt{x}$  at a point  $x$  units from one end. Find the distance from this end to the center of mass of the wire.

$$\text{Solution: } \bar{x} = \frac{\int_0^4 x\sqrt{x} dx}{\int_0^4 \sqrt{x} dx} = \frac{12}{5}$$

4. (5 points) A right circular cylindrical tank of height 3 units and radius 1 unit is filled with a liquid of density  $\delta$ . Find the work done in pumping all the liquid over the top of the tank.

$$\text{Solution: } W = \int_0^3 \delta\pi(3-y) dy = \frac{9\delta\pi}{2}$$