

You may keep this page of questions. Turn in your answers with all of your work on the yellow paper and the orange paper. You are NOT allowed to use your calculator on the first five questions. Answer these five questions on the yellow paper. When you have completed these five questions, turn in all of the yellow paper and receive orange paper to use on the last question. You ARE allowed to use your calculator on the last question and you will probably find that your calculator makes the arithmetic more reasonable.

(1) 15 Points. Analyze and evaluate $\int_1^4 \frac{1}{(x-2)^2} dx$.

(2) 20 Points. Find the volume of the solid of revolution that is generated by revolving the region bounded by $x = 0$, $x = 3$, $y = 0$ and $y = e^x$ about the y -axis.

(3) 15 Points. Set up, but do **NOT** evaluate, a definite integral for the arc length of the curve $y = \sin(x^3)$ between $x = \pi$ and $x = 3\pi$.

(4) 10 Points. A point mass of 3 grams located 4 centimeters to the left of the origin and a point mass of 7 grams located 5 centimeters to the right of the origin are connected by a thin light rod. Find the center of mass of the system.

(5) 25 Points.

Find the mass, M ,

the moment M_x with respect to the x -axis,

the moment M_y with respect to the y -axis and

the center of mass (\bar{x}, \bar{y}) for the plane region bounded by

$$y = 0, y = 3\sqrt{x} \quad \text{and} \quad x = 4$$

if this region has constant density $\delta = 1$.

(6) 15 Points. A certain spring has a natural length of 0.300 meters and exerts a force of 14.0 newtons when it is stretched to the length of 0.450 meters. How much work (in joules) is done in stretching this spring from 0.400 meters to 0.750 meters.