Math 170 Quiz 1, Monday 25 January 2010, 1 page, 15 points, 20 minutes.
ANSWERS.

(5 points) Find the center of mass of this system of three points:

location	$(1,3)$	$(2,-1)$	$(-1,2)$	sum
mass	3	2	5	10
moment	$(3,9)$	$(4.-2)$	$(-5,10)$	$(2,17)$

Add the first three numerical columns to get the fourth column. Divide the moment of the system by the mass of the system, to get the centroid: $\boxed{(0.2,\ 1.7)}$ or $\boxed{(1/5,\ 17/10)}$.

In each of the following problems, set up **but do not evaluate** an integral for the specified quantity. That is, your answer should be an expression of the form

$$\int_{\text{some number}}^{\text{some number}} \text{some function} \quad d \quad \text{some letter}.$$

(5 points) The arclength of the curve $y = x^2 + 3 \quad (0 \le x \le 2)$.

Solution. We have $(ds)^2 = (dx)^2 + (dy)^2$, so $ds = \sqrt{1 + (dy/dx)^2}$. In this case, $dy/dx = 2x$, so $L = \boxed{\int_0^2 \sqrt{1+4x^2}\,dx}$.

(5 points) The surface area of the solid that is generated when the curve described above is rotated around the y-axis.

Solution. We have $A = \int 2\pi r ds$, as discussed in class. In this case, we're rotating around the y-axis, and so $r = x$. That yields $A = \boxed{\int_0^2 2\pi x\sqrt{1+4x^2}\,dx}$.