

MAT 202
Assignment 6
Wednesday, July 31, 2013

For full credit on these problems, each must be submitted with a complete and clear solution, showing all of your work. You may work with other classmates on these problems, but please indicate on your assignment if you received help. Partial answers and incomplete solutions may be eligible for some partial credit, depending on the level of completeness and demonstrated understanding.

1. Evaluate the following anti-derivatives.

(a) $\int \frac{x^2+2x+6}{x+5} dx$

(b) $\int \frac{x+5}{x^2+2x+6} dx$

(c) $\int \frac{\sin x}{1+\cos^2 x} dx$

2. Suppose that it takes 100 lbs of force to compress a spring 4 inches from its natural length. Find the work done in compressing the spring an additional 3 inches.
3. A rectangular tank with a base 4 feet by 5 feet and a height of 6 feet is full of water. The water weighs 62 pounds per cubic foot. How much work is done in pumping water out over the top edge in order to empty
- (a) half of the tank?
- (b) all of the tank?
4. A spacecraft weighs 15 tons on the surface of the earth. How much work is done in propelling the craft to a height of 500 miles above the surface of the earth?
5. Find the center of mass of the given system of point masses:

(x_i, y_i)	(2,-2)	(-1,2)	(0,3)	(3, 1)	(-2, -3)
m_i	5	10	4	6	3

6. Find M_x , M_y and $(\bar{x}, \bar{y})$ for the lamina of uniform density ρ bound by the graphs of $f(x) = x^2 - 3x + 3$ and $g(x) = x + 3$.
7. Consider the parallelogram in the plane with vertices $A = (0, 0)$, $B = (a, b)$, $C = (a, b + c)$ and $D = (0, c)$ where $a, b, c > 0$.
- (a) Find the centroid of the parallelogram, in terms of a, b and c .
- (b) Find the point of intersection of line segment $\overline{AC}$ and $\overline{BD}$.
- (c) Compare your answers in part (a) and (b).