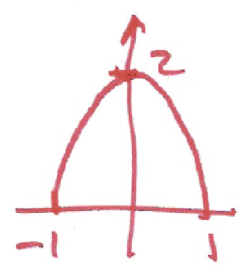
Problem 5. (10 pts) Evaluate $\int_0^1 \int_0^x x^2 e^{xy}\, dy dx$.

A. 1
B. $(e/2) - 1$
C. e
D. $e^2 - 1$
E. None of the above

$$\int_0^1 \left[x e^{xy} \Big|_0^x \right] dx$$
$$= \int_0^1 (x e^{x^2} - x)\, dx$$
$$= \left(\frac{1}{2} e^{x^2} - \frac{x^2}{2}\right)\Big|_0^1$$
$$= \frac{1}{2} e - \frac{1}{2} - \frac{1}{2} = \boxed{\frac{1}{2} e - 1}$$

Problem 6. (10 pts) Find the centroid for the region

$$\{-1 \le x \le 1; \underset{0 \le}{y} \le 2 - 2x^2\}.$$



A. $(0, 4/5)$
B. 1
C. $(1, 0)$
D. $(0, 2/3)$
E. None of the above

$\bar{X} = 0$ By Symmetry

$$\bar{Y} = \frac{\int_{-1}^1 \int_0^{2-2x^2} y\, dy dx}{\int_{-1}^1 \int_0^{2-2x^2} 1\, dy dx} =$$

$$= \frac{\int_{-1}^1 2(1 + x^4 - 2x^2)\, dx}{\int_{-1}^1 (2 - 2x^2)\, dx} = 2\, \frac{\left(x + \frac{x^5}{5} - \frac{2x^3}{3}\right)\Big|_{-1}^1}{\left(2x - \frac{2x^3}{3}\right)\Big|_{-1}^1} = \boxed{\frac{4}{5}}$$