1.)

$$M_y = \int_0^1 \int_{x^2}^{x(2-x)} x(1+x)\, dy\, dx = \int_0^1 \left[yx(1+x) \right]_{x^2}^{x(2-x)} dx$$

$$= 2\int_0^1 (x^4 - x^2)\, dx = 2\left[\frac{x^5}{5} - \frac{x^3}{3} \right]_0^1 = \boxed{4/15}$$

$$M = \int_0^1 \int_{x^2}^{x(2-x)} (1+x)\, dy\, dx = \int_0^1 (2x - 2x^3)\, dx = \boxed{\frac{1}{2}}$$

$$\bar{x} = \frac{M_y}{M} = \boxed{\frac{8}{15}}$$