b) $f(x) = \begin{cases} \frac{3}{2}x^2 & -1 < x < 1 \\ 0 & \text{otherwise} \end{cases}$

a) $\frac{3}{2}\int_{-2}^{0} x^2\,dx$

$\frac{3}{2}\left(\frac{1}{3}\right)\left(x^3\Big|_{-2}^{0}\right)$

$\frac{1}{2}\left((0)^3-(-2)^3\right)$

$\frac{1}{2}(8) = \boxed{4}$

b) $\frac{3}{2}\int_{.5}^{1} x^2\,dx$

$\frac{3}{2}\left(\frac{1}{3}\right)\left(x^3\Big|_{.5}^{1}\right)$

$\frac{1}{2}\left((1)^3+\left(\frac{1}{2}\right)^3\right)$

$\frac{1}{2}\left(1+\frac{1}{8}\right)$

$\frac{9}{16}$

c) $\frac{3}{2}\int_{.5}^{1} x^2\,dx$

$\frac{1}{2}\left(x^3\Big|_{.5}^{1}\right)$

$\frac{1}{2}\left((1)^3-\left(\frac{1}{2}\right)^3\right)$

$\frac{1}{2}\left(1-\frac{1}{8}\right)$

$\boxed{\frac{7}{16}}$

$\frac{3}{2}\int_{-.5}^{1} x^2\,dx$

$\frac{1}{2}\left(x^3\Big|_{-.5}^{1}\right)$

$\boxed{\frac{9}{16}}$

$7/16 \Big/ \frac{9}{16}$

$\frac{7}{16}\cdot\frac{16}{9}$

$\boxed{\frac{7}{9}}$

$\frac{P(x>.5)}{P(x>-.5)}$

d) $\frac{3}{2}\int_{-1}^{1} x^3\,dx$

$\frac{3}{2}\left(\frac{1}{4}\right)\left(x^4\Big|_{-1}^{1}\right)$

$\frac{3}{8}\left((1)^4-(-1)^4\right)$

$\frac{3}{8}(0) = \boxed{\frac{3}{8}}$

e) $\frac{3}{2}\int_{-1}^{1} x^4\,dx$

$\frac{3}{2}\left(\frac{1}{5}\right)\left(x^5\Big|_{-1}^{1}\right)$

$\frac{3}{10}\left((1)^5-(-1)^5\right)$

$\frac{3}{10}(1+1)$

$\frac{3}{5}$

$\mathrm{Var}(x) = E(x^2) - E(x)^2$

$= \frac{3}{5} - (0)^2$

$\boxed{\frac{3}{5}}$ $\quad \boxed{\sigma_x = \sqrt{\frac{3}{5}}}$

f) $\frac{3}{2}\int_{-1}^{x} x^2\,dx$

$\frac{1}{2}\left(x^3-(-1)^3\right)$

$\boxed{F(x) = \frac{1}{2}(x^3+1)}$