a. $\int_0^4 \frac{1}{8}(4-y) = \frac{1}{8}\int_0^4 (4-y)\,dy$

$= \frac{1}{8}\left[4y - \frac{y^2}{2}\right]\Big|_0^4 = \frac{1}{8} \cdot 8 = 1$

$F(x) = \frac{1}{8}\left(4y - y^2/2\right) = \frac{y}{2} - y^2/16$

b) $P(x < 100) = \cancel{E(x)}\ F(1) = \frac{1}{2} - \frac{1}{16} = \frac{7}{16}$

$= \boxed{0.4375}$

c) $P(200 \le x \le 300) = F(3) - F(2)$

$F(3) = 3/2 - (3)^2/16 = 3/2 - 9/16 = 0.9375$

$F(2) = 2/2 - 4/16 = 0.75$

$F(3) - F(2) = 0.9375 - 0.75 = \boxed{0.1875}$

d) $F(x) = 0.5 \rightarrow \frac{y}{2} - \frac{y^2}{16} = 0.5$

$E(x) = \mu = \quad -\underbrace{\left(\frac{1}{16}\right)}_{a} y^2 + \underbrace{\left(\frac{1}{2}\right)}_{b} y - \underbrace{0.5}_{c} = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-\frac{1}{2} \pm \sqrt{\left(\frac{1}{2}\right)^2 - 4\left(-\frac{1}{16}\right)\left(-\frac{1}{2}\right)}}{2\left(-\frac{1}{16}\right)}$

$= \frac{-0.5 \pm 0.354}{-1.25}$

$= 0.1168, \ 0.6832$

$$F(x) = y/2 - y^2/16$$

$$0.5 = y/2 - y^2/16$$

$$0 = \frac{-y^2}{16} + \frac{y}{2} - 0.5$$

$a = -1/16 \quad b = 1/2 \quad c = \cancel{0} -1/2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-1/2 \pm \sqrt{(\frac{1}{2})^2 - 4(-\frac{1}{16})(-\frac{1}{2})}}{2(\frac{-1}{16})}$$

$$x = \frac{-0.5 \pm 0.354}{-0.125}$$

$$= 1.1716,\ 6.8284$$

e. $P(\mu) = P(1.1716) = 2500(1.1716) - 1250$

$$= \boxed{1679}$$

3. 43 ksi (mean), 4.5 ksi (sd)

a) $z\left(\frac{x-\mu}{\sigma}\right)$ | $x = 50$ ksi, $\mu = 43$ ksi, $\sigma = 4.5$ ksi

$= z(1.\bar{5})$

$= \boxed{0.9406}$

b) $P(40 \le x \le 48) = z\left(\frac{48-\mu}{\sigma}\right) - z\left(\frac{40-\mu}{\sigma}\right)$

$\mu = 43$ ksi, $\sigma = 4.5$ ksi

$= z(1.\bar{1}) - z(-0.\bar{6})$

$= 0.8665 - 0.2514$

$= \boxed{0.6151}$

~~e) $P(\mu) = P$~~

3c) $z\left(\frac{x-\mu}{\sigma}\right) = 0.90$

$$\frac{x-\mu}{\sigma} = 1.29$$

$$x = (1.29)\sigma + \mu \quad \Big| \quad \sigma = 4.5\,ksi, \ \mu = 43\,ksi$$

$$= \boxed{48.805\,ksi}$$