3)

2) $g(x) = 1200x - 50x^2$

$\mu_{g(x)} = E(g(x)) = \sum_x g(x) f(x)$

$= \sum_{x=0}^{3} (1200x - 50x^2) f(x)$

$= 0 \cdot f(0) + (1200-50) \cdot f(1) +$

$(1200\times2 - 50\times4) \cdot f(2) + (1200\times3 - 50\times9) \cdot f(3)$

$= 1855$

) $E(x) = \int_0^1 2x(1-x)\,dx = \frac{1}{3}$

So the dealer's average profit per automobile is:

$\frac{1}{3} \times 5000 = 1666.67\,\$$

$[E(x)]^2 = \frac{1}{9}$ | $E(x^2) = \int_0^1 2x^2(1-x)\,dx = \frac{1}{6}$

$var(x) = \frac{1}{6} - \frac{1}{9} = \frac{1}{18}$

$\frac{1}{18} \times 5000 = 277.78\,\$$

7) $E(X) = np$ ..

$Var(x) = np(1-p)$...

a) $E(X) = 4 \times 0.0001 = 0.0004$

b) $Var(x) = 4 \times 0.0001 \times (1 - 0.0001)$

$= 0.0004$

a) $E(x) = \int x f(x)\,dx = \int_0^\infty x \frac{1}{2000} e^{-\frac{x}{2000}} = 2000$

$E(x^2) = \int_0^\infty x^2 \frac{1}{2000} e^{\frac{-x}{2000}} = 8000000$

$var(x) = E(x^2) - [E(x)]^2 = 8000000 - 2000^2$

$= 4\,000\,000$

$E(x^2) = \int_0^\infty x^2 \frac{1}{2000} e^{-\frac{x}{2000}} = 8000000$

) total cost = \$20 (cost of the test) + P(failure) × \$100 (cost of replace)

$S(t) = 1 - \int_0^t f(x)dx$ for $t = 3000 \Rightarrow$

$S(3000) = e^{-\frac{3}{2}}$ | $P(\text{failure}) = 1 - S(3000) = 1 - e^{-3/2}$

Avg total cost $= \$20 + [1 - e^{-3/2}] \times \$100 = 98\,\$$

4) $P(x = 800) = 0.6$

$P(X = -1000) = 0.4$

- The expected for single investment:

Expected profit (single investment) =

$(0.6 \times 800) + (0.4 \times (-1000)) = 160$

~~therefore~~ - Nick has 2 investments:

Expected profit (total) $= 160 \times 2 = 320$

6) a) $E(x) = \frac{a+b}{2} = \frac{2}{2} = 1$

b) $C = 30 + 5x \Rightarrow E(C) = E(30 + 5X)$

$= 30 + E(5X) = 30 + 5E(x)$

$= 30 + 5(1) = 35$

or

a) $\int_0^2 0.5x\,dx = 1$