1

1.1

$$
\begin{aligned}
&50, 50, 20, 10\\
&f(50, 50) = 1/6\\
&f(50, 20) = 1/3\\
&f(50, 10) = 1/3\\
&f(20, 10) = 1/6\\
&E[X] = \frac{100 + 30}{6} + \frac{60 + 70}{3} = 65
\end{aligned}
$$

1.2

$$var(X) = \sigma^2 = \frac{35^2}{6} + \frac{5^2}{3} + \frac{5^2}{3} + \frac{35^2}{6} = 425$$

1.3

$$E[X/5 - 4] = E[X]/5 - 4 = 9$$

1.4

$$var(X/5 - 4) = var(X)/25 = 17$$

2

2.1

$$
\begin{aligned}
&E[X] = \int_0^5 x/5dx = [x^2/2]_0^5/5 = 2.5\\
&var(X) = E[X^2] - E[X]^2 = \int_0^5 x^2/5dx - 2.5^2 = [x^3/3]_0^5/5 - 2.5^2 = 25/12
\end{aligned}
$$

2.2

$$
\begin{aligned}
&E[4/3\pi X^3] = 4/3\pi E[X^3] = 4/3\pi \int_0^5 x^3/5dx = 4/15\pi[x^4/4]_0^5 = 4/15\pi 5^4/4 = \frac{5^3\pi}{3}\\
&var(4/3\pi X^3) = 16/9\pi^2 var(X^3) = 16/9\pi^2(E[X^6] - E[X^3]^2) = 16/9\pi^2(\frac{5^6}{7} - \frac{5^6}{16})
\end{aligned}
$$

3

$$f_X(x) = \binom{n}{x} p^x \cdot (1 - p)^{n-x}$$

$$E[X] = \sum_0^n \binom{n}{x} p^x \cdot (1 - p)^{n-x} \cdot x = np$$

$$var(X) = E[X^2] - E[X]^2 =? - (np^2) = np - np^2$$

4

$$E[X] = \int_0^\infty 1/5x \cdot e^{-x/5} dx = [-x \cdot e^{-x/5}]_0^\infty + \int_0^\infty 5e^{-x/5} dx = 5$$

$$var(X) = \int_0^\infty 1/5x^2 \cdot e^{-x/5} dx - 5^2 = .. = 25$$