3.17 (a) Area $= \int_1^3 (1/2)\ dx = \left.\frac{x}{2}\right|_1^3 = 1$.

(b) $P(2 < X < 2.5) \int_2^{2.5} (1/2)\ dx = \left.\frac{x}{2}\right|_2^{2.5} = \frac{1}{4}$.

(c) $P(X \leq 1.6) = \int_1^{1.6} (1/2)\ dx = \left.\frac{x}{2}\right|_1^{1.6} = 0.3$.

3.18 (a) $P(X < 4) = \int_2^4 \frac{2(1+x)}{27}\ dx = \left.\frac{(1+x)^2}{27}\right|_2^4 = 16/27$.

(b) $P(3 \leq X < 4) = \int_3^4 \frac{2(1+x)}{27}\ dx = \left.\frac{(1+x)^2}{27}\right|_3^4 = 1/3$.

3.19 $F(x) = \int_1^x (1/2)\ dt = \frac{x-1}{2}$,
$P(2 < X < 2.5) = F(2.5) - F(2) = \frac{1.5}{2} - \frac{1}{2} = \frac{1}{4}$.

3.20 $F(x) = \frac{2}{27} \int_2^x (1+t)\ dt = \frac{2}{27} \left.\left(t + \frac{t^2}{2}\right)\right|_2^x = \frac{(x+4)(x-2)}{27}$,
$P(3 \leq X < 4) = F(4) - F(3) = \frac{(8)(2)}{27} - \frac{(7)(1)}{27} = \frac{1}{3}$.

4.12 $E(X) = \int_0^1 2x(1-x)\ dx = 1/3$. So, $(1/3)(\$5,000) = \$1,667.67$.

5.29 Using the hypergeometric distribution, we get

(a) $\frac{\binom{12}{2}\binom{40}{5}}{\binom{52}{7}} = 0.3246$.

(b) $1 - \frac{\binom{48}{7}}{\binom{52}{7}} = 0.4496$.

5.31 Using the hypergeometric distribution, we get $h(2; 9, 6, 4) = \frac{\binom{4}{2}\binom{5}{4}}{\binom{9}{6}} = \frac{5}{14}$.

5.34 $h(2; 9, 5, 4) = \frac{\binom{4}{2}\binom{5}{3}}{\binom{9}{5}} = \frac{10}{21}$.

5.58 (a) Using the Poisson distribution with $x = 5$ and $\mu = 3$, we find from Table A.2 that

$$p(5;3) = \sum_{x=0}^{5} p(x;3) - \sum_{x=0}^{4} p(x;3) = 0.1008.$$

(b) $P(X < 3) = P(X \leq 2) = 0.4232.$

(c) $P(X \geq 2) = 1 - P(X \leq 1) = 0.8009.$

5.63 (a) Using the Poisson distribution with $\mu = 5$, we find

$$P(X > 5) = 1 - P(X \leq 5) = 1 - 0.6160 = 0.3840.$$

(b) Using the binomial distribution with $p = 0.3840$, we get

$$b(3;4,0.384) = \binom{4}{3}(0.3840)^3(0.6160) = 0.1395.$$

(c) Using the geometric distribution with $p = 0.3840$, we have

$$g(5;0.384) = (0.394)(0.616)^4 = 0.0553.$$