3.66. (a)

$$\sum_y p(y) = \sum_{y=1}^{\infty} q^{y-1} p = p[1 + q + q^2 + \cdots]$$

$$= p \cdot \frac{1}{1-q} = p \cdot \frac{1}{p} = 1$$

(b).

$$\frac{p(y)}{p(y-1)} = \frac{q^{y-1} p}{q^{y-2} p} = q.$$

$\Rightarrow Y \sim Geo(p)$, $Y=1$ has the highest probability

3.76

$$P(Y > y_0) \geq .1$$

$$P(Y > y_0) = 1 - \sum_{y=1}^{y_0} q^{y-1} p$$

Let $S = \sum_{y=1}^{y_0} q^{y-1} p = p[1 + q + \cdots + q^{y_0 - 1}]$

$$q \cdot S = p[q + q^2 + \cdots + q^{y_0}]$$

$$\Rightarrow S - qS = p[1 - q^{y_0}]$$

$$S = \frac{p(1-q^{y_0})}{1-q}$$

$$\Rightarrow P(Y > y_0) = 1 - \frac{p(1-q^{y_0})}{1-q} = 1 - (1-q^{y_0}) = q^{y_0}$$

max $y_0 \leq \log 0.1 / \log 0.1 \Rightarrow y_0 \leq 6$

3.142. (a)

$$p(y) = \frac{e^{-\lambda} \cdot \lambda^{y}}{y!}$$

$$\frac{p(y)}{p(y-1)} = \frac{\lambda}{y} \quad \text{for } y = 1, 2, 3 \ldots$$

(b) when $y < \lambda$

$$p(y) > p(y-1)$$

(c) when $y \leq \lambda$,

$$p(y) \leq p(y-1)$$

when $y > \lambda$

$$p(y) > p(y-1)$$

$\Rightarrow$ $p(y)$ is maximized when

y is the greatest integer $\leq \lambda$.