4.3\[ f(x) = \frac{1}{b-a} = \frac{1}{20} \text{ for } 10 \leq x \leq 30.\]

\[ \mu = (a+b)/2 = (10+30)/2 = 20 \]
\[ \sigma = \frac{b-a}{\sqrt{12}} = \frac{20}{\sqrt{12}} \approx 5.774 \]

\[ \begin{array}{c|c|c}
\hline
1 & 2 & 3 \\
\hline
8.452 & 10 & 14.226 \\
14.226 & 20 & 25.774 \\
25.774 & 30 & 31.547 \\
\hline
\end{array} \]

\[ \begin{aligned}
\text{a)} P(\mu - \sigma \leq x \leq \mu + \sigma) & = P(14.226 \leq x \leq 25.774) = \frac{25.774 - 14.226}{20} \\
\text{e)} P(\mu - 2\sigma \leq x \leq \mu + 2\sigma) & = P(8.452 \leq x \leq 31.547) = \frac{1}{2} = 0.5774 \\
\end{aligned} \]

\[ \begin{aligned}
\text{All of these probabilities are } \frac{5}{20} = \frac{1}{4} \text{ since all of the intervals of same width included in } [10,30] \text{ have the same probability — that's what we mean by "uniform".}
\end{aligned} \]

4.1\[ f(x) = (3, 3/4) \]

\[ \begin{aligned}
\text{a)} \quad \text{Total Area} & = \text{Area in (1) + (2)} \\
& = (2)(1/4) + (2)(3/4) \\
& = 2/4 + 6/4 = 1.
\end{aligned} \]

\[ \begin{aligned}
\text{Also } f(x) \geq 0 \text{ for } [1,3] \\
\text{so } f \text{ is a legitimate density function.}
\end{aligned} \]

\[ \begin{aligned}
\text{b)} P(x \leq 2). \text{ Picture:}
\end{aligned} \]

\[ \text{Area of trapezoid } = 1 \begin{array}{c|c|c}
\hline
\hline
1 & 2 & 3 \\
\hline
\hline
\end{array} \]
\[ P(X \geq 2) = 1 - P(X \leq 2) = 1 - \frac{3}{8} = \frac{5}{8} \]

d) \( P(1.2 \leq X < 2.2) \).

\[
\text{Picture:}
\]

Area = \( \square + \square = (1)(3) + \frac{1}{2} (1)(2.5) = 3 + 1.25 = 4.25 \)

4.4 Uniform on 48 inches: \([0, 48]\).

\[
\text{Picture of density function:}
\]

Can recover 40 unscratched inches if scratch is in first 8 inches OR last 8 inches. We need

\[
P(X \leq 8) + P(X > 40). \quad \text{Picture:}
\]

\[
\frac{1}{48} bh + \frac{1}{48} bh = \left( \frac{8}{48} \right) \left( \frac{48}{48} \right) + \left( \frac{8}{48} \right) \left( \frac{48}{48} \right) = 16/48 = 1/3
\]

4.7 In order for a person on the 2nd floor to be on the 1st floor within 1 minute of pushing the button, we need \( X \leq 40 \) sec since it will take 20 sec.
to get down to the 1st floor.

Picture of density for \( X \):

40 seconds = \( \frac{2}{3} \) of 1 minute

\[
P(X \leq 40 \text{ sec}) = P(X \leq \frac{2}{3} \text{ min}) = bh = \left( \frac{2}{3} \right) \left( \frac{1}{2} \right) = \frac{1}{3}
\]

4.9 a) Picture

![Picture](image)

From Table N,

\[
P(Z < 2.13) = .9834
\]

b) Picture

![Picture](image)

\[
P(-1.13 < Z < 1.13) = P(Z < 1.13) - P(Z < -1.13) = .8708 - .1292 = .7416
\]

c) \( P(1.13 \leq Z) = P(Z \geq 1.13) = 1 - P(Z < 1.13) = 1 - .8708 = .1298
\]

Picture:

![Picture](image)

4.11

a) Looking for 32.28\textsuperscript{th} percentile. Use table in reverse.

From table, \( Z = -1.46 \)

b) Looking for 95\textsuperscript{th} percentile. Use table in reverse.

From table, \( Z = 1.645 \) (Tie, 1.64 or 1.65)

\( c) P(Z_0 \leq Z) = P(Z \geq Z_0) = 0.0519 \) means

\( P(Z \leq Z_0) = .1949. \)