(2) $X \sim$ random temperature (°C)

Uniform $A = -5$ $B = 5$

$f(x) = \frac{1}{b-a} = \frac{1}{10}$ $-5 \le x \le 5$

a. $P(X < 0) = \int_{-5}^{0} \frac{1}{10}\,dx = \underline{\underline{\frac{1}{2}}}_{ANS}$

b. $P(-2.5 < x < 2.5) = \int_{-2.5}^{2.5} \frac{1}{10}\,dx = \underline{\underline{\frac{1}{2}}}_{ANS}$

c. $P(-2 \le x \le 3) = \int_{-2}^{3} \frac{1}{10}\,dx = \underline{\underline{\frac{1}{2}}}_{ANS}$

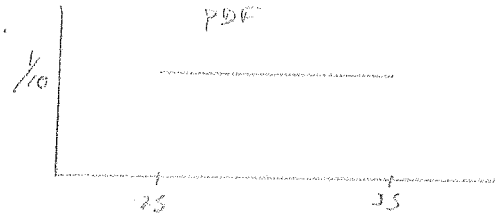
d. $P(k < x < k+4) = \int_{k}^{k+4} \frac{1}{10}\,dx = \frac{x}{10}\Big|_{k}^{k+4} = \frac{k+4}{10} - \frac{k}{10} = \frac{4}{10} = \underline{\underline{0.4}}_{ANS}$

(7) $X \sim$ time (m) to prepare equipment

Uniform $\rightarrow A = 25$ $B = 35$

PDF $\rightarrow f(x) = \frac{1}{35-25} = \frac{1}{10}$ $25 \le x \le 35$

a.



b. $P(X > 33) = \int_{33}^{35} \frac{1}{10}\,dx = \frac{2}{10} = \underline{\underline{0.2}}_{ANS}$

c. $P(\mu - 2 > x > \mu + 2)$

$\mu = \int_{25}^{35} \frac{1}{10} x\,dx = 30 \rightarrow P(28 > x > 32) = \int_{28}^{32} \frac{1}{10}\,dx = \frac{4}{10} = \underline{\underline{0.4}}_{ANS}$

d. $P(a > x > a+2) = \int_{a}^{a+2} \frac{1}{10}\,dx = \frac{x}{10}\Big|_{a}^{a+2} = \frac{a+2}{10} - \frac{a}{10} = \frac{2}{10} = \underline{\underline{0.2}}_{ANS}$

(14) $X \sim$ depth (cm) of bioturbation layer

Uniform $(7.5, 20)$

$f(x) = \frac{1}{20-7.5} = \frac{1}{12.5} = 0.08 \qquad 7.5 \le x \le 20$

a. $\mu = \frac{20+7.5}{2} = \frac{27.5}{2} = \underline{13.75\text{ cm}}$ Ans

$\sigma^2 = \int_{7.5}^{20} (x-13.75)^2 (0.08)\,dx = \underline{13.02\text{ cm}^2}$ Ans $= \frac{(b-a)^2}{12}$

b. $F(x) = \begin{cases} 0 & x < 7.5 \\ \frac{x-7.5}{12.5} & 7.5 \le x \le 20 \\ 1 & x \ge 20 \end{cases}$

c. $P(X \le 10) = \int_{7.5}^{10} f(x)\,dx = \underline{0.2}$ Ans

$P(10 \le X \le 15) = \int_{10}^{15} f(x)\,dx = \underline{0.4}$ Ans

d. $P(\mu - \sigma \le X \le \mu + \sigma)$

$\sigma = \sqrt{13.02} = 3.608324$

$P(10.14 < X < 17.36) = \underline{0.5776}$ Ans

$P(\mu - 2\sigma \le X \le \mu + 2\sigma)$

$P(6.53 \le X \le 20.97) = P(7.5 \le X \le 20) = \underline{1}$ Ans

11/2/06

(66) X = time (min) spent by a randomly selected student

$\Gamma(x; \alpha, \beta)$ with $\mu = 20$ min, $\sigma^2 = 80$ min^2

a. $\mu = \alpha\beta = 20$
$\sigma^2 = \alpha\beta^2 = 80$ 2 eqns, 2 unks $\Rightarrow$ $\alpha = 5$, $\beta = 4$ ans

b. $P(X \le 24) = F(24) = \underline{0.714943}$ ans

c. $P(20 \le X \le 40) = F(40) - F(20) = \underline{0.411241}$ ans

(67) X = transistor lifetime (weeks) subjected to accelerated life test

$\Gamma(x; \alpha, \beta)$ with $\mu = 24$ weeks, $\sigma = 12$ weeks $\Rightarrow$ $\alpha = 4$, $\beta = 6$

a. $P(12 \le X \le 24) = F(24) - F(12) = \underline{0.423653}$ ans

b. $P(X \le 24) = F(24) = \underline{0.56653}$ ans Median must be less than 24 because 24 represents the 56th percentile

c. 99th percentile $\Rightarrow F(x) = 0.99 \Rightarrow x = \underline{60.28}$ weeks ans

d. 99.5th percentile $\Rightarrow F(x) = 0.995 \Rightarrow x = \underline{66}$ weeks ans