

77. $5\pi \cos 5\pi x$

79. $-x \sec^2 x - \tan x$ 81. $\frac{-x \sin x - 2 \cos x}{x^3}$

83. $24 \sin 4x \cos 4x + 1 = 12 \sin 8x + 1$

85. $-6 \csc^3 x \cot x$ 87. $e^{x(\cot x - \csc^2 x)}$

89. $y = 8x - 8\pi$ 91. $y = \frac{1}{4}$ 93. $y = 2x$

95. Relative maximum: (0.523, 1.128)

Relative minimum: (2.616, 0.443)

97. Relative maxima: $(\frac{\pi}{2}, 2), (\frac{3\pi}{2}, 0)$

Relative minima: $(\frac{7\pi}{6}, -\frac{1}{4}), (\frac{11\pi}{6}, -\frac{1}{4})$

99. (a) 116.25 thousand, day 274

(b) 34.75 thousand, day 90

101. $-3 \cos x - 2 \sin x + C$ 103. $\frac{1}{4} \sin^4 x + C$

105. $\pi + 2$ 107. $\frac{2\sqrt{3}}{3}$ 109. 0 111. 2

113. 1 115. $\frac{5}{3}$ 117. 6.9 quadrillion Btu

119. 21.11 inches 121. $\frac{1}{5}$ 123. $\frac{19}{12}$ 125. $-\frac{5}{4}$

127. $\frac{1}{2}$ 129. 0 131. 0 133. ∞

135. $g(x)$ grows faster than $f(x)$.

SAMPLE POST-GRAD EXAM QUESTIONS

(page 614)

1. d 2. d 3. d 4. c 5. b

CHAPTER 9

SECTION 9.1 (page 622)

Prerequisite Review

1. 1 2. 1 3. 2 4. 2 5. $\frac{1}{2}$
 6. 1 7. 37.50% 8. $81\frac{9}{11}\%$
 9. $54\frac{1}{6}\%$ 10. 43.75%

1. (a) $S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

(b) $A = \{HHH, HHT, HTH, THH\}$

(c) $B = \{HTT, THT, TTH, TTT\}$

3. (a) $S = \{3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48\}$

(b) $A = \{12, 24, 36, 48\}$

(c) $B = \{9, 36\}$

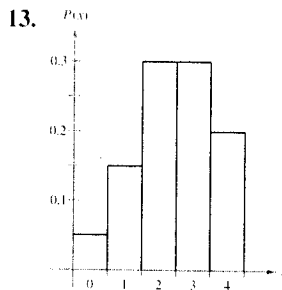
5. 0.24 7. 0.0145

9.

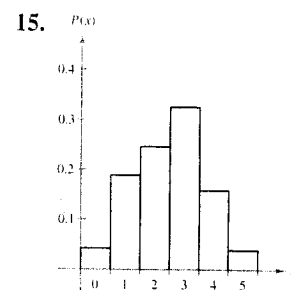
Random variable	0	1	2
Frequency	1	2	1

11.

Random variable	0	1	2	3
Frequency	1	3	3	1



(a) $\frac{3}{4}$ (b) $\frac{1}{5}$

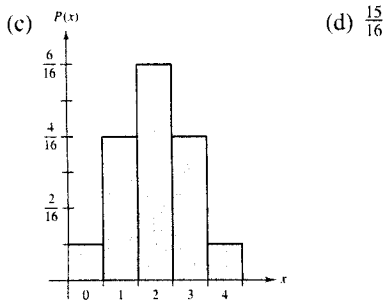


(a) 0.803 (b) 0.197

17. (a) $S = \{gggg, gggb, ggbg, gbgb, bgbb, gbbb, gbgb, gbbg, bgbg, bbgg, bgbb, gbbb, bbbb, bbgb, bbbg, bbbb\}$

(b)

x	0	1	2	3	4
$P(x)$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{6}{16}$	$\frac{1}{16}$	$\frac{1}{16}$



19. There are 16 possibilities, as indicated in the following chart.

	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

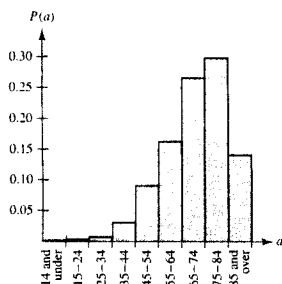
(a) $\frac{9}{16}$ (b) $\frac{3}{16}$ (c) $\frac{3}{16}$ (d) $\frac{1}{16}$

21. $E(x) = 3$ $V(x) = 0.875$ $\sigma = 0.9354$
 23. $E(x) = 0.8$ $V(x) = 8.16$ $\sigma = 2.8566$

25. (a) Mean: 2.5 Variance: 1.25
 (b) Mean: 5 Variance: 2.5
 27. (a) $E(x) = 18.5$ $\sigma = 8.0777$
 (b) \$54,575

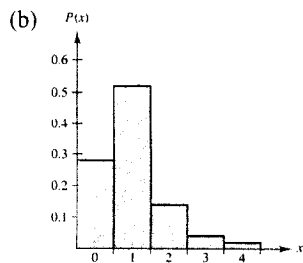
29. \$201 31. $-\$0.0526$ 33. City 1

35. (a) (b) 0.5488 or 54.88%
 (c) 0.9567 or 95.67%
 (d) 0.0054 or 0.54%



37. (a)

x	0	1	2	3	4
$P(x)$	$\frac{14}{50}$	$\frac{26}{50}$	$\frac{7}{50}$	$\frac{2}{50}$	$\frac{1}{50}$



(c) $\frac{35}{50}$ (d) $E(x) = 1, V(x) = 0.76, \sigma \approx 0.87$

Answers will vary.

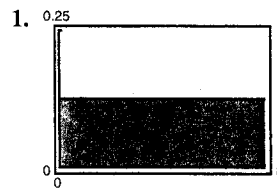
39. Mean: 4.4

Standard deviation: 2.816

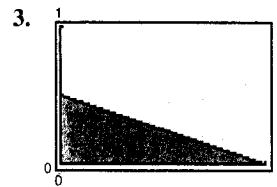
SECTION 9.2 (page 631)

Prerequisite Review

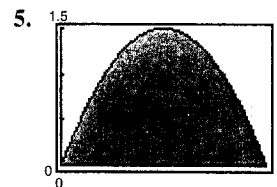
1. Yes 2. No 3. No 4. Yes 5. 1
 6. $\frac{1}{2}$ 7. 1 8. $\frac{1}{4}$ 9. 1 10. 1



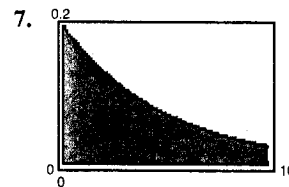
$$\int_0^8 \frac{1}{8} dx = \left[\frac{1}{8}x \right]_0^8 = 1$$



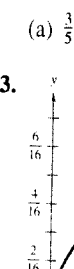
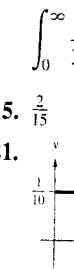
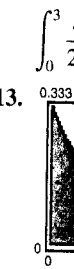
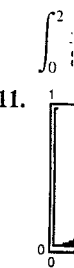
$$\int_0^4 \frac{4-x}{8} dx = \left[\frac{1}{2}x - \frac{1}{16}x^2 \right]_0^4 = 1$$

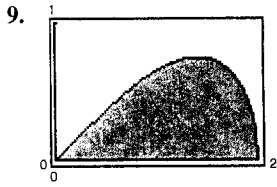


$$\int_0^1 6x(1-x) dx = \left[3x^2 - 2x^3 \right]_0^1 = 1$$

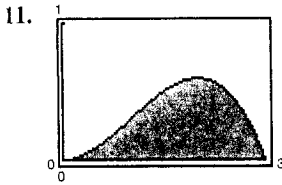


$$\int_0^{\infty} \frac{1}{5} e^{-x/5} dx = \lim_{b \rightarrow \infty} \left[-e^{-x/5} \right]_0^b = 1$$

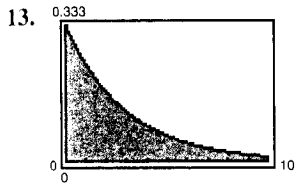




$$\int_0^2 \frac{3}{8}x\sqrt{4-x^2} dx = \left[-\frac{(4-x^2)^{3/2}}{8} \right]_0^2 = 1$$

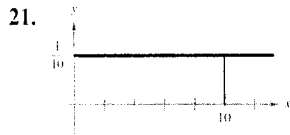


$$\int_0^3 \frac{4}{27}x^2(3-x) dx = \frac{4}{27} \left[x^3 - \frac{x^4}{4} \right]_0^3 = 1$$

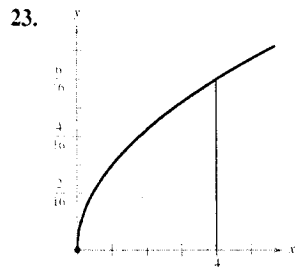


$$\int_0^\infty \frac{1}{3}e^{-x/3} dx = \lim_{b \rightarrow \infty} \left[-e^{-x/3} \right]_0^b = 1$$

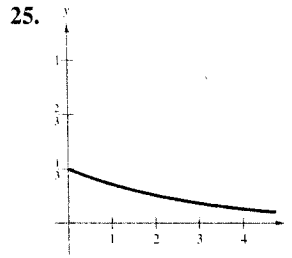
15. $\frac{2}{15}$ 17. $\frac{3}{32}$ 19. $\frac{1}{2}$



- (a) $\frac{3}{5}$ (b) $\frac{1}{5}$ (c) $\frac{1}{5}$ (d) $\frac{1}{5}$



- (a) $\frac{\sqrt{2}}{4} \approx 0.354$
 (b) $1 - \frac{\sqrt{2}}{4} \approx 0.646$
 (c) $\frac{1}{8}(3\sqrt{3} - 1) \approx 0.525$
 (d) $\frac{3\sqrt{3}}{8} \approx 0.650$



- (a) $e^{-0/3} - e^{-2/3} \approx 0.4866$
 (b) $e^{-2/3} - 0 \approx 0.5134$
 (c) $e^{-1/3} - e^{-4/3} \approx 0.4529$
 (d) 0

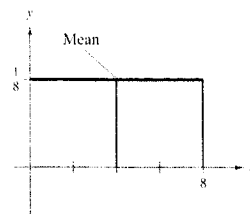
27. (a) $\frac{1}{6}$ (b) $\frac{2}{5}$
 29. (a) $1 - e^{-2/3} \approx 0.487$ (b) $e^{-2/3} - e^{-4/3} \approx 0.250$
 (c) $e^{-2/3} \approx 0.513$
 31. $1 - e^{-4/3} \approx 0.736$
 33. (a) $-\frac{1}{6}(12e^{-1} - 6) \approx 0.264$ (b) $2e^{-1} - 3e^{-2} \approx 0.330$
 (c) $1 - (1 - 3e^{-2}) \approx 0.406$
 35. (a) 0.75. There is a 75% probability that the community will receive up to 10 inches of rain.
 (b) 0.25. There is a 25% probability that the community will receive 10 to 15 inches of rain.
 (c) 0.25. There is a 25% probability that the community will receive up to 5 inches of rain.
 (d) ≈ 0.095 . There is a 9.5% probability that the community will receive 12 to 15 inches of rain.
 37. (a) $0.987 = 98.7\%$ (b) $0.366 = 36.6\%$

SECTION 9.3 (page 641)

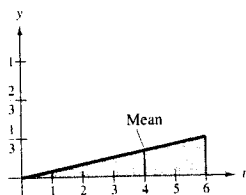
Prerequisite Review

1. 5 2. 8 3. $3 \ln |2|$ 4. $9 \ln |2|$
 5. $\frac{1}{3}$ 6. $\frac{1}{3}$ 7. $\frac{3}{4}$ 8. $\frac{2}{9}$
 9. (a) $\frac{1}{4}$ (b) $\frac{1}{2}$ 10. (a) $\frac{1}{2}$ (b) $\frac{11}{16}$

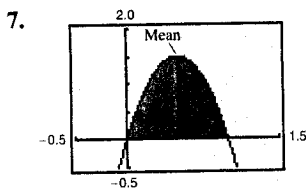
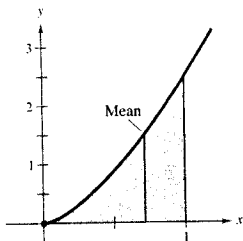
1. (a) 4 (b) $\frac{16}{3}$ (c) $\frac{4}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$



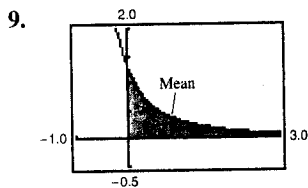
3. (a) 4 (b) 2 (c) $\sqrt{2}$



5. (a) $\frac{5}{7}$ (b) $\frac{20}{441}$ (c) $\frac{2\sqrt{5}}{21}$



Mean: $\frac{1}{2}$



Mean ≈ 0.848

11. $-9 \ln \frac{1}{2} \approx 6.238$

13. Uniform density function

Mean: 5

Variance: $\frac{25}{3}$

Standard deviation: $\frac{5\sqrt{12}}{6} \approx 2.887$

15. Exponential density function

Mean: 8

Variance: 64

Standard deviation: 8

17. Normal density function

Mean: 100

Variance: 121

Standard deviation: 11

19. Mean: 0

Standard deviation: 1

$P(0 \leq x \leq 0.85) \approx 0.3023$

23. Mean: 8

Standard deviation: 2

$P(3 \leq x \leq 13) \approx 0.9876$

25. (a) $P(x > 64) \approx 0.3694$ (b) $P(x > 70) \approx 0.2023$

(c) $P(x < 70) \approx 0.7977$ (d) $P(33 < x < 65) \approx 0.6493$

27. (a) Mean: 10:05 A.M.

(b) $\frac{3}{10}$

Standard deviation: $\frac{5\sqrt{3}}{3} \approx 2.9$ minutes

29. (a) $f(t) = \frac{1}{2}e^{-t/2}$

(b) $P(0 < t < 1) = 1 - e^{-1/2} \approx 0.3935$

31. (a) $f(t) = \frac{1}{5}e^{-t/5}$ (b) $0.865 = 86.5\%$

33. (a) 1.5 standard deviations (b) 0.9332

35. (a) $\mu = 3, \sigma = \frac{3\sqrt{5}}{5} \approx 1.342$

(b) 3 (c) $0.626 = 62.6\%$

37. $\mu = \frac{4}{7}$

$V(x) = \frac{8}{147}$

39. (a) 10 (b) $P(x \leq 4) \approx 0.1912$

41. Mean: $\frac{11}{2} =$ median

43. Mean: $\frac{1}{6}$

45. Mean: 5

Median: 0.1465

Median: $5 \ln 2 \approx 3.4657$

47. $\frac{1}{-0.28} \ln 0.5 \approx 2.4755$

49. (a) Expected value: 6

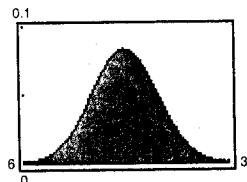
Standard deviation: $3\sqrt{2} \approx 4.243$

(b) 0.615

51. $\mu \approx 12.25$

53. 40.68%

55. (a)



(b) $0.252 = 25.2\%$

CHAPTER 9 REVIEW EXERCISES (page 647)

1. $S = \{\text{January, February, March, April, May, June, July, August, September, October, November, December}\}$

3. If th

$S =$

5. $S =$

- 7.



$n(x)$



- 9.



(a) $\frac{5}{6}$

11. (a) $\frac{5}{36}$

13. 19.5

17. $V(x) =$

$\sigma \approx 46$

- 21.



- 23.



$\int_1^9 \frac{1}{4\sqrt{x}}$

25. $\frac{9}{25}$

31. $\frac{1}{2}$

- 33.

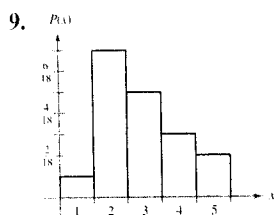
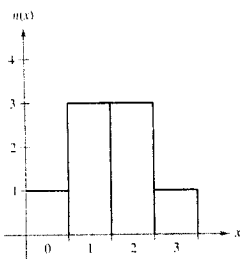
3. If the essays are numbered 1, 2, 3, and 4.

$$S = \{123, 124, 134, 234\}.$$

5. $S = \{0, 1, 2, 3\}$

7.

x	0	1	2	3
$n(x)$	1	3	3	1

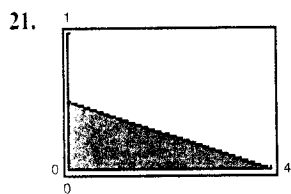


(a) $\frac{5}{6}$ (b) $\frac{5}{9}$

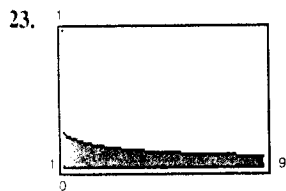
11. (a) $\frac{5}{36}$ (b) $\frac{5}{6}$ (c) $\frac{1}{6}$ (d) $\frac{1}{36}$

13. 19.5 15. (a) 20.5 (b) \$15,375

17. $V(x) = 218,243.7500$ 19. $V(x) \approx 1.1611$
 $\sigma \approx 467.1657$ $\sigma \approx 1.0775$



$$\int_0^4 \frac{1}{8}(4-x) dx = \left[\frac{1}{2}x - \frac{x^2}{16} \right]_0^4 = (2 - 1) = 1$$



$$\int_1^9 \frac{1}{4\sqrt{x}} dx = \frac{1}{4} \left[2\sqrt{x} \right]_1^9 = 1$$

25. $\frac{9}{25}$ 27. $\frac{2}{3}$ 29. (a) $\frac{1}{2}$ (b) $\frac{1}{4}$
 31. $\frac{1}{2}$ 33. 2.5 35. 6

37. Variance: $\frac{9}{20}$

Standard deviation: $\frac{3}{2\sqrt{5}}$

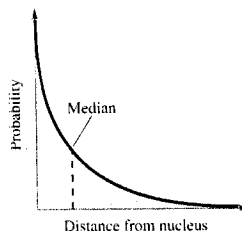
39. Variance: 4

Standard deviation: 2

41. $\frac{1}{2}$ 43. 2.7726 45. (a) 0.4866 (b) 0.2498

47. 0.00383 49. 0.3829

51.



SAMPLE POST-GRAD EXAM QUESTIONS

(page 650)

1. c 2. b 3. c 4. e 5. a 6. c

CHAPTER 10

SECTION 10.1 (page 658)

Prerequisite Review

1. 0 2. 0 3. 2 4. ∞ 5. 0 6. 0

7. $\frac{n-2}{n}$ 8. $\frac{n-3}{n-4}$ 9. $\frac{3n^2+1}{n^3}$

10. $\frac{2n+1}{(n-1)(n+2)}$

1. 2, 4, 8, 16, 32 3. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}$ 5. $3, \frac{9}{2}, \frac{27}{6}, \frac{81}{24}, \frac{243}{120}$

7. $-1, \frac{1}{4}, -\frac{1}{9}, \frac{1}{16}, -\frac{1}{25}$ 9. Converges to 0

11. Converges to 1 13. Converges to $\frac{1}{2}$ 15. Diverges

17. Converges to 0 19. Diverges 21. Converges to 3

23. Converges to 0 25. Diverges 27. Diverges

29. Diverges 31. $3n-2$ 33. $5n-6$

35. $\frac{n+1}{n+2}$ 37. $\frac{(-1)^{n-1}}{2^{n-2}}$ 39. $\frac{n+1}{n}$ 41. $2(-1)^n$

43. $\frac{(-1)^n x^n}{n}$ 45. 2, 5, 8, 11, 14, 17, ...

47. $1, \frac{5}{3}, \frac{7}{3}, 3, \frac{11}{3}, \frac{13}{3}, \dots$ 49. $3, -\frac{3}{2}, \frac{3}{4}, -\frac{3}{8}, \frac{3}{16}, -\frac{3}{32}, \dots$

51. 2, 6, 18, 54, 162, 486, ... 53. Geometric, $20\left(\frac{1}{2}\right)^{n-1}$