5B Evens Chapter 6

6.1:

24)

$$f^{-1}(x) = \frac{3x+1}{4-2x}.$$

26)

$$f^{-1}(x) = \tfrac{1}{2} + \sqrt{x + \tfrac{1}{4}}.$$

48)

$$\frac{dy}{dx} = \frac{1}{\sqrt{1-\sin^2 y}} = \frac{1}{\sqrt{1-x^2}}.$$

6.3:

68)

$$x + 2y = 1 + \ln 2.$$

6.4:

42) $a=e^2$

62)

$$f(1/e) = (1/e)\ \ln(1/e) = -1/e.$$

82)

$$\frac{1}{2\ln 2}2^{x^2} + C.$$

86) $\pi\ln 10$

6.6

36. $f(x) = \arcsin(e^x) \quad \Rightarrow \quad f'(x) = \dfrac{1}{\sqrt{1-(e^x)^2}} \cdot e^x = \dfrac{e^x}{\sqrt{1-e^{2x}}}.$

$\text{Domain}(f) = \{x \mid -1 \le e^x \le 1\} = \{x \mid 0 < e^x \le 1\} = (-\infty, 0].$

$\text{Domain}(f') = \{x \mid 1 - e^{2x} > 0\} = \{x \mid e^{2x} < 1\} = \{x \mid 2x < 0\} = (-\infty, 0).$

38)

$$y' = \frac{1 + x^4y^2 + y^2 + x^4y^4 - 2xy}{x^2 - 2xy - 2x^5y^3}$$

40)

$$y = -\sqrt{3}\,x + \pi + \sqrt{3}.$$

6.8
2) a) indeterminate b) infinity c) infinity
4) a) indeterminate b) 0 c) indet. d) indet e) infinity f) indet
74) 0

<u>6.5:</u>
14) $y = 5e^{2x}$
16) 11:55 a.m.

<u>7.1:</u>
66) $1 - \frac{2}{\pi}\ln 2$

<u>7.2:</u>
56) a) $-\frac{1}{2}\cos^2 x + C$ b) $\frac{1}{2}\sin^2 x + C$ c) $-\frac{1}{4}\cos 2x + C$ d) $\frac{1}{2}\sin^2 x + C$
62) $\frac{3}{8}\pi^2$

<u>7.3:</u>
30) $\ln(\sqrt{2} + 1)$
40) Area inside circle and below parabola: $6\pi - \frac{4}{3}$
Area inside circle and above parabola: $2\pi + \frac{4}{3}$
44) 74.8%

<u>7.5:</u>
10) $-\frac{1}{x}\sin\left(\frac{1}{x}\right) - \cos\left(\frac{1}{x}\right) + C$
22) $\sqrt{1 + (\ln x)^2} + C$

7.6:
2) $\frac{\pi}{8}$

7.8:
2) b, c, d

7.7:
22) n=20

Chapter 11 Even Answers

<u>11.1</u>
12) {2, 1, -1, -2, -1, 1, ...}
18)

Two possibilities are $a_n = \sin \frac{n\pi}{2}$ and $a_n = \cos \frac{(n-1)\pi}{2}$.

<u>11.2</u>
68) , S=3

82)

If $\sum_{n=1}^{\infty} a_n$ is convergent, then $\lim_{n\to\infty} a_n = 0$ by Theorem 6, so $\lim_{n\to\infty} \frac{1}{a_n} \neq 0$, and so $\sum_{n=1}^{\infty} \frac{1}{a_n}$ is divergent by the Test for Divergence.

84)

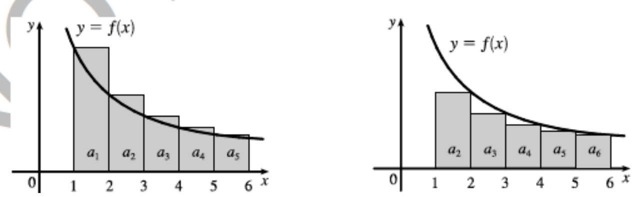
If $\sum ca_n$ were convergent, then $\sum(1/c)(ca_n) = \sum a_n$ would be also, by Theorem 8(i). But this is not the case, so $\sum ca_n$ must diverge.

86)

No. For example, take $\sum a_n = \sum n$ and $\sum b_n = \sum(-n)$, which both diverge, yet $\sum(a_n + b_n) = \sum 0$, which converges with sum 0.

<u>11.3</u>

From the first figure, we see that $\int_1^6 f(x)\,dx < \sum_{i=1}^{5} a_i$. From the second figure, we see that $\sum_{i=2}^{6} a_i < \int_1^6 f(x)\,dx$. Thus, we have $\sum_{i=2}^{6} a_i < \int_1^6 f(x)\,dx < \sum_{i=1}^{5} a_i$.

2) 

34) a) b) c)

40) $n > e^{100}$

<u>11.4</u>
2)

(a) If $a_n > b_n$ for all n, then $\sum a_n$ is divergent. [This is part (ii) of the Comparison Test.]

(b) We cannot say anything about $\sum a_n$. If $a_n < b_n$ for all n and $\sum b_n$ is divergent, then $\sum a_n$ could be convergent or divergent.

<u>11.5</u>

32) $p>0$

11.6

4) Absolutely Convergent
44) Converges for

11.7

2) C 4) D 6) C 8) AC 10) C 12) C 14) AC 16) D 18) CC 20) C
22) D 24) D 26) C 28) C 30) CC 32) D 34) D 36) C 38) D

11.8

30) a) C b) D c) C d) D

11.9

30)

11.10

50) 60)

11.11

18)

(a) $f(x) = \ln(1+2x) \approx T_3(x)$

$$= \ln 3 + \tfrac{2}{3}(x-1) - \frac{4/9}{2!}(x-1)^2 + \frac{16/27}{3!}(x-1)^3$$

(b) $|R_3(x)| \le \dfrac{M}{4!}|x-1|^4$, where $\left|f^{(4)}(x)\right| \le M$. Now $0.5 \le x \le 1.5 \;\Rightarrow$

$-0.5 \le x-1 \le 0.5 \;\Rightarrow\; |x-1| \le 0.5 \;\Rightarrow\; |x-1|^4 \le \frac{1}{16}$, and

letting $x = 0.5$ gives $M = 6$, so $|R_3(x)| \le \dfrac{6}{4!} \cdot \dfrac{1}{16} = \dfrac{1}{64} = 0.015\,625$.

8.1

36) (a) (b) s increasing on $[0, \pi]$, $x=0, \pi$ asymptotes

8.2

18) 28)

10.1

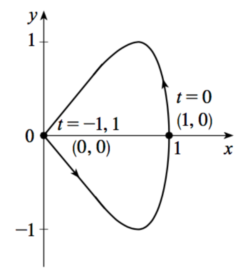
24. (a) From the first graph, we have $1 \le x \le 2$. From the second graph, we have $-1 \le y \le 1$. The only choice that satisfies either of those conditions is III.

(b) From the first graph, the values of x cycle through the values from -2 to 2 four times. From the second graph, the values of y cycle through the values from -2 to 2 six times. Choice I satisfies these conditions.

(c) From the first graph, the values of x cycle through the values from -2 to 2 three times. From the second graph, we have $0 \le y \le 2$. Choice IV satisfies these conditions.

(d) From the first graph, the values of x cycle through the values from -2 to 2 two times. From the second graph, the values of y do the same thing. Choice II satisfies these conditions.

26. When $t = -1$, $(x, y) = (0, 0)$. As t increases to 0, x increases from 0 to 1, while y first decreases to -1 and then increases to 0. As t increases from 0 to 1, x decreases from 1 to 0, while y first increases to 1 and then decreases to 0. We could achieve greater accuracy by estimating x- and y-values for selected values of t from the given graphs and plotting the corresponding points.



28. (a) $x = t^4 - t + 1 = (t^4 + 1) - t > 0$ [think of the graphs of $y = t^4 + 1$ and $y = t$] and $y = t^2 \ge 0$, so these equations are matched with graph V.

(b) $y = \sqrt{t} \ge 0$. $x = t^2 - 2t = t(t-2)$ is negative for $0 < t < 2$, so these equations are matched with graph I.

(c) $x = \sin 2t$ has period $2\pi/2 = \pi$. Note that
$y(t + 2\pi) = \sin[t + 2\pi + \sin 2(t + 2\pi)] = \sin(t + 2\pi + \sin 2t) = \sin(t + \sin 2t) = y(t)$, so y has period 2π.
These equations match graph II since x cycles through the values -1 to 1 twice as y cycles through those values once.

(d) $x = \cos 5t$ has period $2\pi/5$ and $y = \sin 2t$ has period π, so x will take on the values -1 to 1, and then 1 to -1, before y takes on the values -1 to 1. Note that when $t = 0$, $(x, y) = (1, 0)$. These equations are matched with graph VI.

(e) $x = t + \sin 4t$, $y = t^2 + \cos 3t$. As t becomes large, t and t^2 become the dominant terms in the expressions for x and y, so the graph will look like the graph of $y = x^2$, but with oscillations. These equations are matched with graph IV.

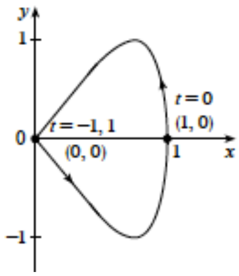
(f) $x = \dfrac{\sin 2t}{4 + t^2}$, $y = \dfrac{\cos 2t}{4 + t^2}$. As $t \to \infty$, x and y both approach 0. These equations are matched with graph III.

5B Chapter 10 Even Answers

<u>10.1</u>

24) a) III b) I c) IV d) II

26)



28) a) V b) I c) II d) VI e) IV f) III

<u>10.3</u>

20) xy=1/2