

## Test 3 Review

### 1) Chapter 9 Check Your Understanding:

2. F

6. F

7. T

8. T

9. F

10. F

12. F

14. F

15. F

16. F

17. T

19. T

21. F

22. T

23. F

24. F

25.F

### 2) Chapter 9 Review:

1.  $\frac{n^2}{(3n^2+4)} < \frac{1}{3}$  so  $\sum_{n=1}^{\infty} \left(\frac{n^2}{(3n^2+4)}\right)^n < \sum_{n=1}^{\infty} \left(\frac{1}{3}\right)^n$ , and the geometric series converges because  $\frac{1}{3} < 1$ .

3. Converges

4. Converges

6. Converges (geometric series)

8. Converges (ratio test)

16. a.  $0.23232323\dots = 0.23 + 0.23(0.01) + 0.23(0.01)^2 + 0.23(0.01)^3 + \dots$

b. The sum is

$$(0.23) \frac{1}{1 - 0.01} = \frac{22}{99}.$$

24. We know that the radius of convergence is between 2 and 4 so:

- a. diverges when  $x = 7$ .
- b. converges when  $x = 1$ .
- c. converges when  $x = 0.5$ .
- d. don't know when  $x = 5$ .
- e. diverges when  $x = -3$ .

3) Chapter 10 Check Your Understanding:

- 1. F
- 3. F
- 4. F
- 5. F
- 7. T
- 8. T
- 9. F
- 12. F
- 16. T
- 18. T
- 19. T
- 22. F
- 23. T
- 24. T

4) Chapter 10 Review:

1.  $e + e(x - 1) + \frac{e}{2}(x - 1)^2$  (note: answer in back of book is wrong!)

3.  $-\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\left(x + \frac{\pi}{4}\right) + \frac{1}{2\sqrt{2}}\left(x + \frac{\pi}{4}\right)^2$

5.  $4 + 12(x - 1) + 10(x - 1)^2 + (x - 1)^3$

6.  $\theta^2 - \frac{\theta^6}{2!} + \frac{\theta^{10}}{4!} - \frac{\theta^{14}}{6!} + \dots$
7.  $t^2 - \frac{t^6}{3!} + \frac{t^{10}}{5!} - \frac{t^{14}}{7!} + \dots$
8.  $\frac{1}{2} + \frac{1}{8}x + \frac{3}{64}x^2 + \frac{5}{256}x^3 + \dots$
9.  $1 + 4z^2 + 16z^4 + 64z^6 + \dots$
11.  $\sqrt{R} \left( 1 - \frac{r}{2R} - \frac{r^2}{8R^2} - \frac{r^3}{16R^3} - \dots \right)$
12. a.  $\frac{7((1.02)^{104} - 1)}{0.02(1.02)^{100}}$       b.  $7e^{0.01}$
14.  $16 \left( 1 - \frac{1}{2^{14}} \right)$
15.  $e^{-2}$
17.  $3e$
18.  $0.1 \sin(0.1)$
20.  $1 - \cos x < x\sqrt{1-x} < \ln(1+x) < \arctan x < \sin x < x < e^x - 1$
22.  $\frac{1}{2}$
23. a. 2      b.  $y = 2 - \frac{4}{3}\theta^2$
28. a.  $-c < v < c$
- b. Concave up, asymptotes going to  $+\infty$  when going to  $\pm c$ .
- c.  $m = m_0 \left( 1 + \frac{v^2}{2c^2} + \frac{3v^4}{8c^4} + \dots \right)$
- d. We would expect it to converge for  $|v| < c$ .
30. a.  $F = \frac{GM}{R^2} + \frac{Gm}{(R+r)^2}$
- b.  $F = \frac{GM}{R^2} + \frac{Gm}{R^2} \left( 1 - 2\frac{r}{R} + 3\left(\frac{r}{R}\right)^2 - \dots \right)$
- c. The first order approximation is  $\frac{G(M+m)}{R^2}$ , so it is like a mass of  $M + m$  placed at  $R$ . The correction is negative, so this approximation is too large.
- 5) Chapter 11 Check Your Understanding:
2. T
3. F
6. T

- 8. F
- 9. T
- 10. F
- 12. F
- 13. T
- 17. T
- 18. F
- 25. T
- 26. T

6) Chapter 11 Review: see back of book for odd numbers.

2.  $P = \frac{t^2}{2} + C$

4.  $P = 5 + Ce^{-2t}$

6.  $R = \frac{Ce^{2t}}{1+3Ce^{2t}}$

10.  $y = \tan x$

12.  $k = t^t$

16.  $y = \frac{10}{1+9e^{-10t}}$

18.  $f(x) = \left(\frac{1}{3}x^{3/2} + \frac{2}{3}\right)^2$

30.  $y = 0$  (stable),  $y = 4$  (unstable),  $y = -2$  (unstable).

36. a.  $\frac{dQ}{dt} = -kQ$  with solution  $Q = Q_0e^{-0.5365t}$       b.  
4 mg.

40. a.  $\sum_{k=0}^{59} 100e^{k/120}$

b. Left sum. Approximately 7752.26

42. a.  $P = 2500$

b. 2230 fish.

c.  $\frac{dP}{dt} = (0.15 - 0.0001P)P$ , 1500 fish.