Math 201-203-RE

Practice Assignment 5

In this fifth practice assignment, you will review topics from
7th edition: sections 6.6 , 8.6 , 10.1 and 10.2.
8th edition: sections 6.5 , 10.1 and 10.2 plus L'Hôpital's Rule.
Try all problems for practice.
If you have difficulties, ask for help in class or in the instructor's office; all answers are shown in another file.

(1) $\lim\limits_{x\to\infty} \dfrac{2x^3+\sqrt{x}}{3-5x^3}$ (2) $\lim\limits_{x\to 0} \dfrac{e^{-3x}+x^3-1}{1-e^{5x}}$ (3) $\lim\limits_{x\to 0} \dfrac{e^x-x^2-1}{\sin 2x}$

(4) $\lim\limits_{x\to 0} \dfrac{e^x-x^3-1}{\sin\left(\frac{x}{2}\right)}$ (5) $\lim\limits_{x\to\infty} \dfrac{4\,e^{3x}-x^2}{1+x+6\,e^{3x}}$ (6) $\lim\limits_{x\to\infty} \dfrac{e^{2/x}-3x^2}{4x^2-e^{3/x}}$

(7) $\lim\limits_{x\to 0} \dfrac{\cos 3x-5x-1}{\tan 2x}$ (8) $\lim\limits_{x\to\pi} \dfrac{3\,\sin x+2\,\tan 3x}{4\,\tan 2x-x+\pi}$ (9) $\lim\limits_{x\to 2} \dfrac{\cos(x-2)+2x-5}{x-4+2\,e^{x-2}}$

(10) $\lim\limits_{x\to\infty} \dfrac{\sqrt{x+2}+5\sqrt{x+3}}{\sqrt{4x+1}}$ (11) $\lim\limits_{x\to 0} \dfrac{6x^3-5x}{e^x-1}$ (12) $\lim\limits_{x\to -2} \dfrac{3x^3+11x^2+8x-4}{5x^3+21x^2+24x+4}$

(13) $\lim\limits_{x\to\infty} \dfrac{(3x-4)^3}{9x^2-5x^3}$ (14) $\lim\limits_{x\to\pi} \dfrac{\sin 3x+\pi-x}{2-\sec\frac{x}{3}+\tan 2x}$ (15) $\lim\limits_{x\to 2^+} \dfrac{2-x-e^{x-2}}{x^2-4}$

(16) $\displaystyle\int_4^\infty \frac{6}{(4-3x)^{1/3}}\,dx$ (17) $\displaystyle\int_{-\infty}^1 \frac{4x-6}{(x^2-3x+3)^3}\,dx$ (18) $\displaystyle\int_1^\infty \frac{6x}{9+x^2}\,dx$

(19) $\displaystyle\int_{-\infty}^{-2} \frac{2x^3+1}{(x^4+2x)^3}\,dx$ (20) $\displaystyle\int_1^\infty 6x^2\,e^{1-x^3}\,dx$ (21) $\displaystyle\int_0^\infty \frac{9x^2}{(x^3+1)^{5/3}}\,dx$

(22) $\displaystyle\int_0^\infty \frac{x^2+1}{(x^3+3x+4)^{5/2}}\,dx$ (23) $\displaystyle\int_0^1 \frac{2x+7}{\sqrt[3]{x^2+7x-8}}\,dx$ (24) $\displaystyle\int_0^1 \frac{e^{2x}}{1-e^{2x}}\,dx$

(25) $\displaystyle\int_1^2 \frac{2x^2+1}{\sqrt{(2x^3+3x-5)^3}}\,dx$ (26) $\displaystyle\int_3^7 \frac{e^{\sqrt{x-3}}}{\sqrt{x-3}}\,dx$ (27) $\displaystyle\int_0^{\pi/4} \cot 3x\,dx$

(28) $\displaystyle\int_0^{\pi/4} \sec 2x\,\tan 2x\,dx$ (29) $\displaystyle\int_0^{\pi/8} \frac{\sec^2 2x}{\sqrt{1-\tan 2x}}\,dx$ (30) $\displaystyle\int_0^{\pi/3} \frac{\sin 3x}{(1+\cos 3x)^{2/3}}\,dx$

(31) $\lim\limits_{x\to\infty} \dfrac{\sqrt{4x^2+3}}{9-x}$ (32) $\lim\limits_{x\to 0} \dfrac{4x+1-e^{2x}}{4\,e^{3x}-4}$ (33) $\displaystyle\int_{-\infty}^0 \frac{e^{3x}}{(3-e^{3x})^2}\,dx$

(34) $\displaystyle\int_0^1 \frac{e^{\sqrt{x}}}{\sqrt{x}\,\left(e^{\sqrt{x}}+1\right)^2}\,dx$ (35) $\displaystyle\int_1^2 \frac{2x+1}{\sqrt[4]{x^2+x-2}}\,dx$

(36) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{2}\left(\frac{5}{3}\right)^n$ converges or diverges. If the series converges, find its sum.

(37) Determine whether the series $\displaystyle\sum_{n=0}^{\infty} \frac{5}{3}\left(\frac{1}{2}\right)^n$ converges or diverges. If the series converges, find its sum.

(38) Determine whether the series $\displaystyle\sum_{n=0}^{\infty} 250\,(1.2)^n$ converges or diverges. If the series converges, find its sum.

(39) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} 125\,(0.2)^n$ converges or diverges. If the series converges, find its sum.

(40) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{4n^2-n^3}{4-n^2}$ converges or diverges. If the series converges, find its sum.

(41) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{(2+3n)\left(4+n^2\right)}{(2+n^2)\,(1+n)}$ converges or diverges.

If the series converges, find its sum.

(42) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} 6\left(-\frac{2}{3}\right)^n$ converges or diverges. If the series converges, find its sum.

(43) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} 20\left[\left(\frac{1}{4}\right)^n-\left(\frac{1}{5}\right)^n\right]$ converges or diverges.

If the series converges, find its sum.

(44) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{4}\left(\frac{5}{2}\right)^n$ converges or diverges. If the series converges, find its sum.

(45) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{\sqrt{9+n^2}}{n+1}$ converges or diverges. If the series converges, find its sum.

(46) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{n+n^3}{3+n}$ converges or diverges.

If the series converges, find its sum.

(47) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{5}{3^n}$ converges or diverges. If the series converges, find its sum.

(48) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{2^n}{5^{n+1}}$ converges or diverges. If the series converges, find its sum.

(49) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} \frac{3^{n+1}}{4^n}$ converges or diverges. If the series converges, find its sum.

(50) Determine whether the series $\displaystyle\sum_{n=1}^{\infty} 4\,\frac{2^{n+1}}{3^n}$ converges or diverges. If the series converges, find its sum.

(51) Given a repeated decimal $4.\overline{13}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(52) Given a repeated decimal $6.\overline{04}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(53) Given a repeated decimal $3.\overline{09}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(54) Given a repeated decimal $2.\overline{02}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(55) Given a repeated decimal $5.\overline{011}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(56) Given a repeated decimal $1.\overline{06}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(57) Given a repeated decimal $2.\overline{03}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(58) Given a repeated decimal $8.\overline{01}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(59) Given a repeated decimal $2.\overline{22}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(60) Given a repeated decimal $5.\overline{25}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(61) A deposit of 35 dollars is made at the beginning of each month for 4 years into an account that pays 1.5% interest, compounded 12 times a year. Find the balance in the account at the end of the 4 years.

(62) The annual net profit for a company from 1998 to 2002 can be approximately by the model, $a_n = 10\,e^{0.2n}$, $n = 1\,,\ 2\,,\ 3\,,\ \ldots\,,\ N$ where a_n is the annual net profit in millions of dollars and n represents the year with $n = 1$ corresponding to 1998.
Estimate the total net profit earned during this period.

(63) A deposit of 15 dollars is made at the beginning of each month for 5 years into an account that pays 0.9% interest, compounded 12 times a year. Find the balance in the account at the end of the 5 years.

(64) The annual net profit for a company from 1995 to 2000 can be approximately by the model, $a_n = 5\,e^{0.1n}$, $n = 1\,,\ 2\,,\ 3\,,\ \ldots\,,\ N$ where a_n is the annual net profit in millions of dollars and n represents the year with $n = 1$ corresponding to 1995.
Estimate the total net profit earned during this period.

(65) A deposit of 20 dollars is made quarterly for 10 years into an account that pays 1% interest, compounded 4 times a year.
Find the balance in the account at the end of the 10 years.

(66) A deposit of \$500 can be made with two options: earns 2% interest, compounded monthly for 3 years or earns 1.5% interest, compounded quarterly for 3 years. Find the balance after 3 years of both options.

(67) A deposit of \$1200 can be made with two options: earns 1.6% interest, compounded bi-monthly for 5 years or earns 2.3% interest, compounded semi-annually for 5 years.
Find the balance after 5 years of both options.

(68) To create a scholarship of \$600 to be awarded every year, use the series $\sum\ 600\,e^{-0.05n}$ to determine the sum of money required to deposit at a rate of 5% interest per year compounded continuously.
Find the sum.

(69) To create a scholarship of \$2000 to be awarded every year, use the series $\sum\ 2000\,e^{-0.03n}$ to determine the sum of money required to deposit at a rate of 3% interest per year compounded continuously.
Find the sum.

(70) A patient is given 5 units of a drug daily for a long period of time. A portion of the drug remains in the patient's body after n years is given by $\sum\ 5\,e^{-n/2}$. Find the total amount of drug remaining in the patient's body after 4 years and also after 15 years.

(71) A deposit of 10 dollars is made at the beginning of each month for 6 years into an account that pays 1% interest, compounded 12 times a year. Find the balance in the account at the end of the 6 years.

(72) The annual net profit for a company from 1997 to 2003 can be approximately by the model, $a_n = 15\,e^{0.3n}$, $n = 1\,,\ 2\,,\ 3\,,\ \ldots\,,\ N$ where a_n is the annual net profit in millions of dollars and n represents the year with $n = 1$ corresponding to 1997.
Estimate the total net profit earned during this period.

(73) A deposit of 30 dollars is made at the beginning of each month for 7 years into an account that pays 1.1% interest, compounded 12 times a year. Find the balance in the account at the end of the 7 years.

(74) The annual net profit for a company from 1996 to 2001 can be approximately by the model, $a_n = 6\,e^{0.05n}$, $n = 1\,,\ 2\,,\ 3\,,\ \ldots\,,\ N$ where a_n is the annual net profit in millions of dollars and n represents the year with $n = 1$ corresponding to 1996.
Estimate the total net profit earned during this period.

(75) A deposit of 50 dollars is made bi-weekly for 8 years into an account that pays 1.3% interest, compounded every two weeks a year.
Find the balance in the account at the end of the 8 years.

(76) A deposit of \$700 can be made with two options: earns 1.8% interest, compounded bi-weekly for 4 years or earns 2.1% interest, compounded monthly for 4 years. Find the balance after 4 years of both options.

(77) A deposit of \$1500 can be made with two options: earns 1.4% interest, compounded quarterly for 6 years or earns 1.9% interest, compounded monthly for 6 years.
Find the balance after 6 years of both options.

(78) To create a scholarship of \$750 to be awarded every year, use the series $\sum 750\, e^{-0.04n}$ to determine the sum of money required to deposit at a rate of 4% interest per year compounded continuously.
Find the sum.

(79) To create a scholarship of \$1500 to be awarded every year, use the series $\sum 1500\, e^{-0.035n}$ to determine the sum of money required to deposit at a rate of 3.5% interest per year compounded continuously.
Find the sum.

(80) A patient is given 4 units of a drug daily for a long period of time. A portion of the drug remains in the patient's body after n years is given by $\sum 4\, e^{-n/5}$. Find the total amount of drug remaining in the patient's body after 6 years and also after 20 years.

(81) $\lim\limits_{x\to 0} \dfrac{x^2 - e^{2x} + \cos x}{3x^2 + \sin(3x)}$ (82) $\displaystyle\int_0^{\infty} \frac{4x}{(x^2+1)^4}\, dx$ (83) $\displaystyle\int_1^{4} \frac{3x}{(1-x^2)^2}\, dx$

(84) $\displaystyle\int_{-2}^{0} \frac{6x}{\sqrt{4-x^2}}\, dx$ (85) $\lim\limits_{x\to \pi} \dfrac{\sin x - \tan x}{\cos x - \sin x + 1}$ (86) $\lim\limits_{x\to -1} \dfrac{x^3 + x^2 + 4x + 4}{x^3 + 3x^2 + 6x + 4}$

(87) $\lim\limits_{x\to -\infty} \dfrac{4x^2 - e^{3x}}{e^{2x} + 3x^2}$ (88) $\lim\limits_{x\to \infty} \dfrac{(2x-1)^3}{(4x+1)^3}$ (89) $\displaystyle\int_2^{+\infty} \frac{4\, dx}{x\, (\ln x)^2}$

(90) $\displaystyle\int_0^{\pi/6} \frac{3\, \cos x}{(2\sin x)^{1/3}}\, dx$

(91) Determine whether the sequence $a_n = \dfrac{\sqrt{9n^2+2}}{2n+5}$ converges or diverges.
If the sequence converges, find its limit.

(92) Determine whether the sequence $a_n = \dfrac{4\,(n-1)!}{3n!}$ converges or diverges.
If the sequence converges, find its limit.

(93) Determine whether the sequence $\left\{ \dfrac{1}{2} \,.\, 5^{n+1} \right\}_{n=2}^{+\infty}$ converges or diverges.
If the sequence converges, find its limit.

(94) Determine whether the sequence $a_n = 4\left(\dfrac{1}{3}\right)^{n-1}$ converges or diverges.
If the sequence converges, find its limit.

(95) Determine whether the sequence $\left\{ \dfrac{4n+5}{2^{n-1}} \right\}_{n=1}^{+\infty}$ converges or diverges.
If the sequence converges, find its limit.

(96) Determine whether the sequence $a_n = \dfrac{5+n}{\sqrt{3+4n^2}}$ converges or diverges.
If the sequence converges, find its limit.

(97) Given a repeated decimal $10.2\overline{3}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(98) Given a repeated decimal $7.3\overline{4}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(99) Given a repeated decimal $12.30\overline{2}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.

(100) Given a repeated decimal $20.0\overline{21}$, express it as a geometric series, find the sum of the geometric series and write the decimal as the ratio of two integers.