Math 201-203-RE

Practice Assignment 4

In this fourth practice assignment, you will review topics from
7th edition: sections 6.5 , 8.5 , C1 , C2 and C4.
8th edition: sections 6.4 , 8.5 , C1 , C2 and C4.
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) Use the Trapezoidal Rule with $n = 3$ to estimate the value of $\displaystyle\int_1^4 \frac{2}{4x^2+9}\,dx$ (give answer to 3 decimals).

(2) Use the Trapezoidal Rule with $n = 4$ to estimate the value of $\displaystyle\int_1^3 (\ln x + 3)^2\,dx$ (give answer to 3 decimals).

(3) Use the Simpson's Rule with $n = 4$ to estimate the value of $\displaystyle\int_2^4 \frac{6}{\sqrt{1+\ln x}}\,dx$ (give answer to 3 decimals).

(4) Use the Trapezoidal Rule with $n = 4$ to estimate the value of $\displaystyle\int_{-2}^2 \left(x^3+6\right)^{2/3}\,dx$ (give answer to 3 decimals).

(5) Use the Simpson's Rule with $n = 4$ to estimate the value of $\displaystyle\int_2^6 \frac{10}{\sqrt{x^2+4}}\,dx$ (give answer to 3 decimals).

(6) Use the Simpson's Rule with $n = 4$ to estimate the value of $\displaystyle\int_1^9 \sqrt[5]{x^2+3x}\,dx$ (give answer to 3 decimals).

(7) Use the Simpson's Rule with $n = 6$ to estimate the value of $\displaystyle\int_4^{10} \sqrt[3]{x^2+5}\,dx$ (give answer to 3 decimals).

(8) Use the Trapezoidal Rule with $n = 5$ to estimate the value of $\displaystyle\int_2^7 \frac{e^{3-x}}{\ln x}\,dx$ (give answer to 3 decimals).

(9) Use the Simpson's Rule with $n = 6$ to estimate the value of $\displaystyle\int_0^3 \sqrt{x^2+2x}\,dx$ (give answer to 3 decimals).

(10) Use the Trapezoidal Rule with $n = 3$ to estimate the value of $\displaystyle\int_0^{12} \frac{5}{\ln(x+2)}\,dx$ (give answer to 3 decimals).

(11) Use the Simpson's Rule with $n = 4$ to estimate the value of $\displaystyle\int_0^8 \cos\left(x^2+x\right)\,dx$ (give answer to 3 decimals).

(12) Use the Trapezoidal Rule with $n = 3$ to estimate the value of $\displaystyle\int_{-2}^{10} \frac{x^2+1}{x^3+1}\,dx$ (give answer to 3 decimals).

(13) Use the Simpson's Rule with $n = 4$ to estimate the value of $\displaystyle\int_0^4 e^{\cos 3x}\,dx$ (give answer to 3 decimals).

(14) Use the Trapezoidal Rule with $n = 3$ to estimate the value of $\displaystyle\int_0^6 \sin\left(\frac{x^3}{3}\right)\,dx$ (give answer to 3 decimals).

(15) Use the Simpson's Rule with $n = 4$ to estimate the value of $\displaystyle\int_0^1 \sqrt{\cos x}\,dx$ (give answer to 3 decimals).

(16) Evaluate $\displaystyle\int_0^{\pi} \left(\sin 2x - 3\,e^{-3x}\right)\,dx$

(17) Evaluate $\displaystyle\int_{\pi/2}^{\pi} (\sin 3x + 6\,\cos 2x)\,dx$

(18) Evaluate $\displaystyle\int_0^{\pi/2} \left(4\,\cos 8x + 5x^4\right)\,dx$

(19) Evaluate $\displaystyle\int_{\pi/4}^{\pi/2} \left(9\,\csc^2 3x - 36x^3\right)\,dx$

(20) Evaluate $\displaystyle\int_0^{\pi/16} \left(12\,\sec^2 4x - 6\,e^{2x}\right)\,dx$

(21) Evaluate $\displaystyle\int_0^{\pi/8} \frac{\sec 2x\,\tan 2x}{4 - \sec 2x}\,dx$

(22) Evaluate $\displaystyle\int_{\pi/16}^{\pi/8} \frac{\csc^2 4x}{\cot 4x + 1}\,dx$

(23) Evaluate $\displaystyle\int_0^{\pi} \left(\cos 3x - x^2\right)\,e^{\sin 3x - x^3}\,dx$

(24) Evaluate $\displaystyle\int_{\pi/8}^{\pi/4} \csc^2 2x\;e^{1-\cot 2x}\,dx$

(25) Evaluate $\displaystyle\int_0^{\pi/3} (3 - x)\,\cos 2x\,dx$

(26) Evaluate $\displaystyle\int_0^{\pi/6} (2 - 5x)\,\sin 3x\,dx$

(27) Evaluate $\displaystyle\int_0^{\pi/4} \cos 2x\,\left(1 + 3\,\sin 2x\right)^{1/2}\,dx$

(28) Evaluate $\displaystyle\int_0^{\pi/12} \frac{\sec^2 3x}{\sqrt{4 + 3\,\tan 3x}}\,dx$

(29) Evaluate $\displaystyle\int_0^{\pi/12} \frac{\sqrt{1 + 3\,\sin 2x}}{\sec 2x}\,dx$

(30) Evaluate $\displaystyle\int_0^{\pi/9} \frac{\sec 3x\,\tan 3x}{\sqrt{(3 - \sec 3x)^3}}\,dx$

(31) Use the Trapezoidal Rule with $n = 4$ to estimate the value of $\displaystyle\int_1^{5} \cos\left(e^{1-x}\right)\,dx$ (give answer to 4 decimals).

(32) Use the Simpson's Rule with $n = 4$ to estimate the value of $\displaystyle\int_0^{4} e^{\sin x}\,dx$ (give answer to 4 decimals).

(33) Use the Trapezoidal Rule with $n = 3$ to estimate the value of $\displaystyle\int_{-1}^{2} \sqrt{1 + e^x}\,dx$ (give answer to 4 decimals).

(34) Evaluate $\displaystyle\int_{\pi/6}^{\pi/2} \frac{3\,\sin x\,e^{2x} - \cot x}{\sin x}\,dx$

(35) Evaluate $\displaystyle\int_{\pi/12}^{\pi/6} \frac{4\,\cot 2x + 3}{\csc 2x}\,dx$

(36) Find y if $y' = 6x^2\,(y - 2)$ given $y(2) = 3$

(37) Show that $y = 2\,e^{\frac{x^4}{4}}$ is a solution of D.E. $\dfrac{dy}{dx} = x^3\,y$

(38) Find y if $y' = y\,\sin x$ given $y(0) = 1$

(39) Find y if $y' = y^2\,\cos x$ given $y(0) = 1$

(40) Find y if $\dfrac{dy}{dx} = 3x^2\,y$ and $y > 0$, $y(0) = 4$

(41) Find y if $y' = y^2\,(2x + 1)$ given $y(-1) = \frac{1}{5}$

(42) Find y if $\dfrac{dy}{dx} = e^{x+2}\,.\,y^2$ and $y(-2) = -\frac{1}{2}$

(43) Find y if $\sec x\,y' = 4$ and $y(0) = 3$

(44) Find y if $\csc x\,y' = 3y^2$ and $y(0) = 1$

(45) Find y if $\cos^2 x\,y' = 3y^2$ given $y(0) = 1$

(46) The rate of increase of a population P of a city where t is the number of years after 1965 is inversely proportional to the square root of the population size. In 1965 the population was $8\,100$ and in 1985 it was $22\,500$. In how many years will the population reach $44\,100$ people?

(47) The rate of decay at time t in hours of a radioactive substance N is proportional to the amount of substance present. If 80% of the initial amount of radioactive substance remains after 2 hours, find $N(t)$ the amount of radioactive substance at time t if initially the amount of radioactive substance is 10 g .

(48) The rate of decay at time t in hours of a radioactive substance N is proportional to the amount of substance present. If 65% of the initial amount of radioactive substance has decomposed after 5 hours, find the remaining amount of radioactive substance after 10 hours if initially the amount of radioactive substance is 100 g .

(49) The rate of increase of a population P of a town is proportional to the time t (the number of years after 1976) and inversely proportional to the population size P. In 1976 the population was $10\,000$ and in 1986 it was $20\,000$. In what year will the population be $52\,000$?

(50) The rate of increase of a population P of a city is proportional to the product of the population size P and time t (number of years after 1950). In 1950 the population was $1\,500\,000$. The population grew by 5% after 10 years. What was the population of the city in the year 1970 ?

(51) A company has the sales volume S (in millions of dollars) increasing at a rate inversely proportional to the square root of time t (in years). At the present, the sales volume is 40 millions of dollars. The company predicts that in one year, the sales volume will be 50 millions of dollars. Find the sales volume 4 years later.

(52) A software company has the sales volume S (in millions of dollars) increasing at a rate proportional to the product of the square root of both the sales volume S and the time t (in years). The company started with a sales volume of 36 millions of dollars. A year later, the sales volume reached 64 millions of dollars. When will the sales volume reach 484 millions of dollars ?

(53) A metal company has the production increasing at a rate proportional to the product of the number of units N and the time t in years. 400 units are presently produced. In 2 years, 1200 units are expected. What will be the production after 4 years ?

(54) A minivan is bought for $\$32\,000$. The rate of the depreciation value V in dollars at time t in years is proportional to the present value V at time t in years. After 3 years, the vehicle is worth $\$25\,600$. What is the value of the minivan 6 years later ?

(55) A piece of machinery is worth $\$1600$. The rate of the depreciation value V in dollars at time t in years is proportional to the square root of its value V. The piece of machinery will be worth $\$900$ two years later. When will the piece of machinery be worth $\$625$?

(56) A rumor starts with 20 people in a population of 8500. The rate the rumor spreads at time t in weeks proportional to the number of people N who have not heard the rumor. At the end of 2 weeks, 1000 people heard the rumor. How many weeks will it take for 4000 people to hear the rumor?

(57) The production of N units is increasing at a rate proportional to the product of the number of units N and the time t in years. Initially 100 units are produced and 250 units after one year, how long will it take to produce 500 units?

(58) A company has the production increasing at a rate proportional to the product of the number of units N and the time t in years. 16 units are presently produced. In 1 year, 64 units are expected. How long will the production be 1024 units?

(59) A piece of furniture is worth $\$2500$. The rate of the depreciation value V in dollars at time t in years is proportional to the square of its value V. The piece of furniture is worth $\$1500$ two years later. How much will the piece of furniture be worth after 3 years?

(60) The rate of increase of a population P of a city is proportional to the population size P and inversely proportional to time t in years. After 1 year, the population is $75\,000$ and in 5 years it is $225\,000$. What is the population in 20 years?

(61) A rumor starts with 100 people in a population of $100\,000$. The rumor spreads at a rate proportional to the time t in weeks and inversely proportional to the number of people N who heard the rumor. At the end of 5 weeks, $10\,000$ people heard the rumor. How many people will hear the rumor after 25 weeks?

(62) The production of N units is increasing at a rate proportional to the time t in years and inversely proportional to the number of units N. Initially 1000 units are produced and 2000 units after one year, what is the production after 4 years?

(63) A company has the production increasing at a rate proportional to the product of the number of units N and the square of time t in years. 8 units are presently produced. In 1 year, 16 units are expected. After 2 years, what will be the production?

(64) A piece of furniture is worth $\$3600$. The rate of the depreciation value V in dollars at time t in years is proportional to the square root of its value V. The piece of furniture is worth $\$2500$ one year later. How long will it take for the piece of furniture to be worth $\$900$?

(65) The rate of increase of a population P of a city is proportional to the product of the population size P and the square of time t in years. Initially the population is $100\,000$ and in 3 years it is $300\,000$. How long will it take for the population to be $1\,200\,000$ people?

(66) Show that $y = e^{x/2}$ is a solution of D.E. $2y'' + 5y' - 3y = 0$

(67) Show that $y = x^3 - \frac{5}{2}\,x$ is a solution of D.E. $x\,\dfrac{dy}{dx} - 3y = 5x$

(68) Show that $y = 4 - 4\,\cos 2x$ is a solution of D.E. $\sin x\, y' - 2y\,\cos x = 0$

(69) Show that $y = 4 + 8x\,e^x - 3\,e^x$ is a solution of D.E. $y'' - 2y' + y - 4 = 0$

(70) Show that $y = x^2\,(5 + 3\,\ln x)$ is a solution of D.E. $xy' - 2y = 3x^2$

(71) The rate of increase of a population P of a city where t is the number of years after 1975 is proportional to the population size. In 1975 the population was 2500 and in 1977 it was 3000. In what year will the population reach 4320 people?

(72) The rate of decay at time t in hours of a radioactive substance N is proportional to the square amount of substance present. If 80% of the initial amount of radioactive substance remains after 3 hours, find $N(t)$ the amount of radioactive substance at time t if initially the amount of radioactive substance is 15 g.

(73) The rate of decomposition at time t in hours of a substance N is proportional to the amount of substance present. If 70% of the initial amount of substance has decomposed after 4 hours, find the remaining amount of substance after 8 hours if initially the amount of substance is 120 g.

(74) The rate of increase of the members N of a club is proportional to the square of the time t (the number of years after 1982). In 1982 the population was 1700 and in 1985 it was 4400. What is the number of members in the year 1994 ?

(75) The rate of increase of a population P of a city is proportional to the population size P and inversely proportional to the time t (number of years after 1965).
In 1966 the population was $800\,000$. The population grew by 6% after 9 years.
What was the population of the city in the year 1983 ?

(76) A company has the sales volume S (in millions of dollars) at time t (in years) increasing at a rate proportional to the square root of sales volume. At the present, the sales volume is 16 millions of dollars.
The company predicts that in two years, the sales volume will be 25 millions of dollars.
How many years will the sales volume be 49 millions of dollars?

(77) A computer company has the sales volume S (in millions of dollars) increasing at a rate proportional to the product of the square of both the sales volume S and the time t (in years). The company started with a sales volume of 100 millions of dollars. Three years later, the sales volume reached 120 millions of dollars. When will the sales volume reach 165 millions of dollars ?

(78) A company has the production increasing at a rate proportional to the square of the number of units N and inversely proportional to the time t in days. The first day, 300 units are produced.
In 3 days, 400 units are expected. What will be the production after 27 days ?

(79) A car is bought for $\$36\,000$. The rate of the depreciation value V in dollars at time t in years is proportional to the present value V. After 2 years, the vehicle is worth $\$18\,000$.
What is the value of the car 4 years later ?

(80) A piece of machinery is worth $\$2500$. The rate of the depreciation value V in dollars at time t in years is proportional to the square root of its value V. The piece of machinery will be worth $\$900$ three years later. What is the value of the piece of machinery after 6 years ?

(81) Given that the production N in a company during time t in years is increasing at a rate proportional to the square number of units N. Initially, the production is 100 units and at 2 years, the production is 200 units; find the constant values of C and k.

(82) Given that the production N in a company during time t in years is increasing at a rate proportional to the square root of time t. Initially, the production is 50 units and at 4 years, the production is 150 units; find the constant values of C and k.

(83) Given that the production N in a company during time t in years is increasing at a rate proportional to the product of the square root of both the number of units N and the time t. Initially, the production is 400 units and at 1 year, the production is 1764 units; find the constant values of C and k.

(84) Given that the production N in a company during time t in years is increasing at a rate inversely proportional to the square root of time t. Initially, the production is 124 units and after 1 year, the production is 136 units; find the constant values of C and k.

(85) Given that the production N in a company during time t in years is decreasing at a rate proportional to the square number of units N and inversely proportional to time t. At the first year, the production is 70 units and at 8 years, the production is 35 units; find the constant values of C and k.

(86) Given that the production N in a company during time t in years is increasing at a rate inversely proportional to the number of units N and proportional to time t. Initially, the production is 8 units and at 2 years, the production is 10 units; find the constant values of C and k.

(87) Determine $\displaystyle\int \frac{\csc(2x)\left[3x\csc(2x) - 2x^2\sin(2x)\right]}{6x}\,dx$

(88) Determine $\displaystyle\int \frac{3\sin(2x)\left[2x^3\csc(2x) + 10x\right]}{5x}\,dx$

(89) Determine $\displaystyle\int \frac{2\left[6x\csc(2x) - 5x\right]}{3x\tan(2x)}\,dx$

(90) Determine $\displaystyle\int \frac{4\left[6x + 5x\sec(3x)\right]}{3x\cot(3x)}\,dx$

(91) Determine $\displaystyle\int \sin(3x)\,\big[\,4\,\cot(3x) - 5\,\sec(3x)\,\big]\,dx$

(92) Determine $\displaystyle\int \cos(3x)\,\big[\,2\,\csc(3x) + 9\,\tan(3x)\,\big]\,dx$

(93) Find y if $y' = 3\,e^{x-y}$ given $y(0) = 2$

(94) Find y if $y' = \frac{2x^2}{y}$ given $y(1) = 2$ and $y > 0$

(95) Find y if $y' = 4xy$ given $y(2) = 1$ and $y > 0$

(96) Find y if $y' = \frac{3x^2}{\sqrt{y}}$ given $y(1) = 9$

(97) Find y if $y' = \frac{y}{\sqrt{x}}$ given $y(4) = 1$ and $y > 0$

(98) Find y if $x\,y' = \frac{4x^2}{y}$ given $y(1) = 2$ and $y > 0$

(99) Find y if $y' = 2xy + 3x^2 y$ given $y(2) = 1$ and $y > 0$

(100) Find y if $y' = 2\,\sqrt{y}\,e^{3x}$ given $y(0) = \frac{4}{9}$