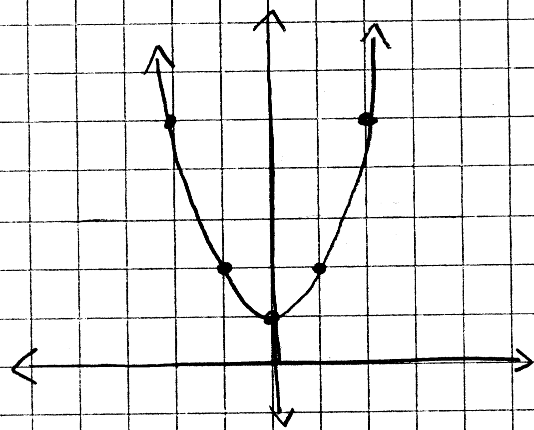
Sections 5.1-5.2 Kyler Wood

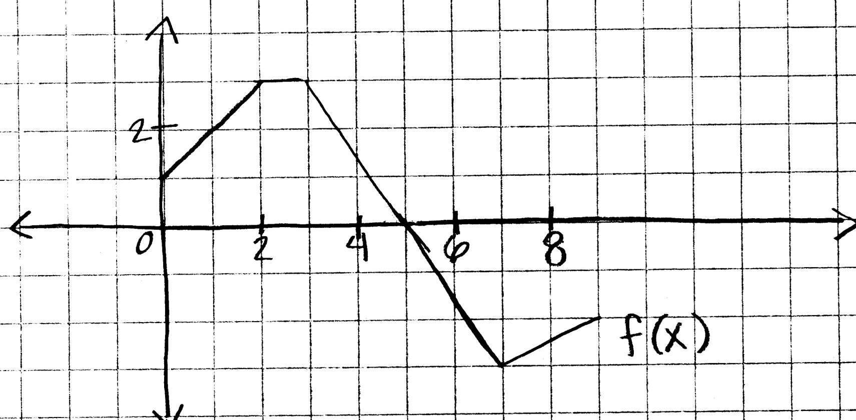
1. Find the area of $f(x) = x^2 + 1$ using right and left endpoints.



2. Evaluate each integral in terms of areas.

a) $\int_0^2 f(x)dx$ b) $\int_0^5 f(x)dx$

c) $\int_5^7 f(x)dx$ d) $\int_0^9 f(x)dx$



Michael Bonacci Sections 5.3 & 5.4

Evaluation Theorem - If f is continuous on the interval $[a,b]$, then

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

where F is any antiderivative of f, that is, $F' = f$.

Evaluate the integral

① $\displaystyle\int_1^2 \frac{v^3 + 3v^6}{v^4}\,dv$ ② $\displaystyle\int_0^{\frac{\pi}{4}} \frac{1+\cos^2\theta}{\cos^2\theta}\,d\theta$

Fundamental Theorem of Calculus, Part 1 -
If f is continuous on $[a,b]$, then the function g defined by

$$g(x) = \int_a^x f(t)\,dt \qquad a \le x \le b$$

is an antiderivative of f, that is, $g'(x) = f(x)$ for $a < x < b$

Part 2 -
$\int_a^b f(x)\,dx = F(b) - F(a)$, where F is any antiderivative of f, that is, $F' = f$.

Use part one of FTC to find derivative of the function

③ $g(y) = \int_2^y t^2 \sin(t)\,dt$ ④ $h(x) = \int_2^{\frac{1}{x}} \arctan(t)\,dt$

Kellen Marchen

Review Problems for Chapters 5.5 - 5.6

Chapter 5.5 The Substitution Rule

$\boxed{\#24}$ Evaluate the indefinite integral

$$\int \frac{\sin(\ln x)}{x}\,dx$$

$\boxed{\#44}$ Evaluate the definite integral

$$\int_0^{\sqrt{\pi}} x\cos(x^2)\,dx$$

Chapter 5.6 Integration by Parts

$\boxed{\#4}$ Evaluate the integral

$$\int xe^{-x}\,dx$$

$\boxed{\#17}$ Evaluate the integral

$$\int_1^2 \frac{\ln x}{x^2}\,dx$$

Erin Smith
5.7

1. $\int_0^{\pi/2} \sin^2 x \cos^2 x \, dx$ Solve the trigonometric integral.

2. $\int \frac{\sqrt{9-x^2}}{x^2}$ Solve the integral using trigonometric substitution.

3. $\int_0^1 \frac{x-4}{x^2-5x+6} \, dx$ Evaluate the integral using partial fractions.

4. $\int \frac{r^2}{r+4}$ use long division to evaluate the integral.

Cassandra Cori

5.9

#1. Use Simpson's Rule to approximate:

$$\int_0^2 \frac{x}{1+x^2}\,dx \quad , \quad n=10$$

#2. Use Trapezoidal Rule to approximate:

$$\int_0^4 e^{\sqrt{t}} \sin t \, dt \quad , \quad n=8$$

5.10

#3. Is the integral convergent or divergent? If conv. what does it conv to?

$$\int_3^\infty \frac{1}{(x-2)^{3/2}}\,dx$$

#4. Is the integral convergent or divergent? If conv. what does it converge to?

$$\int_0^\infty xe^{-5x}\,dx$$

Neal Sharma

6.1

1. $x=\sqrt{y}$ $\quad y=\sqrt{8x}$

Find the region bounded between the two curves.
area of the

2. $x=y^2-4y$ $\quad x=y(2-y)$

Find the area of the region bounded between the two curves.

6.2

3. Find the volume of the solid when $y=2x^3$ is rotated about the y-axis and is bounded above by $y=16$.

4. $\frac{2\sin^{-1}(\frac{y}{4})}{\pi}=x$ $\quad y=x^2$

Find the volume of the solid when the region bounded by the two curves is rotated about the x-axis.

Chapter 6.4

Tram Nguyen

① find the arc length of $y = 2x - 5$ $\quad -1 \le x \le 3$

② find the arc length

$x = t\cos t \qquad y = t\sin t \qquad 0 \le t \le 2\pi$

Chapter 6.5

② find the average value of the function

$f(x) = \cos^4 x \sin x \qquad [0, \pi]$

④ ⓐ find the average value of $(x-3)^2$

ⓑ find c if $f(c) = \bar{f}(x)$

ⓒ Sketch a graph.

Chapter 6.6

Aaron Miller

1) Suppose that 2J of work is needed to stretch a spring from its natural length of 30cm to a length of 42cm.

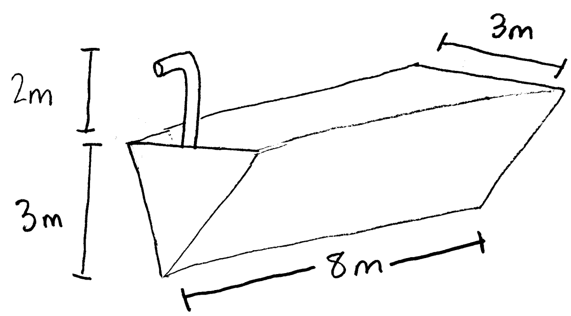
   (a) How much work is needed to stretch the spring from 35cm to 40 cm?

   (b) How far beyond its natural length will a force of 30 N keep the spring stretched?

2) A bucket that weighs 4lb and a rope of negligible weight are used to draw water from a well thats 80 ft deep. The bucket is filled with 40lb of water and is pulled up at a rate of 2ft/s, but water leaks out of the bucket at 0.2 lb/s. Find the work done in pulling the bucket to the top of the well.

3) If the work required to stretch a spring 1 ft beyond its natural length is 12ft-lb, how much work is needed to stretch it 9ft beyond its natural length?

4) A tank is full of water. Find the work required to pump the water out of the spout.



Section 6.7-6.8 Cate Neukranz

1. If a supply curve is modeled by the equation $p = 200 + 0.2x^{3/2}$, find the producer surplus when the selling price is \$400.

2. A movie theater has been charging \$7.50 per person and selling about 400 tickets on a typical weeknight. After surveying their customers, the theater estimates that for every 50¢ that they lower the price, the number of moviegoers will increase by 35 per night. Find the demand function and calculate the consumer surplus when the tickets are priced at \$6.00.

3. A spinner from a board game randomly indicates a real number between 0 and 10. The spinner is fair in the sense that it indicates a number in a given interval with the same probability as it indicates a number in any other interval of the same length.
(a) Explain why the function

$$f(x) = \begin{cases} 0.1 & \text{if } 0 \leq x \leq 10 \\ 0 & \text{if } x < 0 \text{ or } x > 10 \end{cases}$$

is a probability density function for the spinner's values.
(b) What does your intuition tell you about the value of the mean? Check your guess by evaluating an integral.

Cate Neukranz

4. Let $f(x) = kx^2(1-x)$ if $0 \leq x \leq 1$ and
$f(x) = 0$ if $x < 0$ or $x > 1$.
(a) For what value of k is f a probability density function?
(b) For that value of k, find $P(X \geq 1/2)$.
(c) Find the mean.

Thomas Berry

Chapter 7 Review

1. (Section 7.1)
Show that $\frac{2}{3}e^{x} + e^{-2x}$ is a solution of the differential equation $y' + 2y = 2e^{x}$

2. (Section 7.2)
Sketch a direction field for the differential equation $y' = \frac{1}{2}y$. Then use it to sketch three solution curves.

3. (Section 7.3)
Solve the differential equation $dy/dx = xy^2$

4. Find the solution to the differential equation that satisfies the given initial condition.
$\frac{du}{dt} = \frac{2t + \sec^2 t}{2u} \qquad u(0) = -5$

McKenna [illegible]

7.4-7.5: Exponential Growth/Decay; Logistic Growth

1. A population of bacteria quadruples every 60 minutes. After 1 hour, the population is at 20. After 2 hours, the population reaches 80.

   a) Find K, the growth rate.

   b) Find the general solution for the population after t hours.

2. A cup of tea, at 180°F, is sitting in a room at 70°F. After 30 minutes, the tea has cooled to 120°F. How long will it take for the cup of tea to cool to 100°F?

3. A population has a carrying capacity of 1000, and an initial population of 100. If the population grows to 250 after one year, what will the population reach in another five years?

4. Strontium-90 has a half-life of 28 days. Suppose a sample has a mass of 100mg initially. Find an expression that represents the remaining mass after t days. How much remains after 20 days?

PROBLEMS OF SECTIONS 8.1 - 8.2

(1) Determine whether the sequence converges or diverges. If it converges, find its limit.

$$a_n = \frac{\cos^2 n}{2^n}$$

(2) Express the numbers as ratio of integers:

$$0.\overline{73} = 0.737373\ldots$$

(3) Determine whether the series is convergent or divergent. If it is convergent, find its sum:

$$\sum_{n=1}^{\infty} \left(\frac{1}{e^n} + \frac{1}{n(n+1)} \right)$$

Section 8.3 - 8.4 Problems

(1) Determine whether the series is convergent or divergent: $1+\frac{1}{3}+\frac{1}{5}+\frac{1}{7}+\frac{1}{9}+\dots$

(2) $\displaystyle\sum_{n=0}^{\infty}\frac{2+(-1)^n}{n\sqrt{n}}$ convergent or divergent?

(3) Use alternating series test to see if $\displaystyle\sum_{n=0}^{\infty}(-1)^{n+1}\frac{n^2}{n^3+9}$ converges or diverges

(4) Use ratio test to determine whether $\displaystyle\sum_{n=0}^{\infty}\frac{10^n}{(n+1)4^{2n+1}}$ is absolutely convergent

Andrew Hayes

7. Find the Maclaurin series for $f(x)$ using the definition of a Maclaurin Series. Also find the associated radius of convergence.

$f(x) = \sin(\pi x)$

13. Find the Taylor series for $f(x)$ centered at the given value of a.

$f(x) = e^x$, $a = 3$

48. Use series to approximate the definite integral to within the indicated accuracy.

$$\int_0^{0.2} \left[\tan^{-1}(x^3) + \sin(x^3) \right] dx$$ (five decimal places)

60. Find the sum of the series

$$\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{6^{2n}(2n)!}$$

8.8 Applications of Taylor Polynomials

Andrew Hayes

5-7 Find the Taylor polynomial $T_3(x)$ for the function f at the number a. Graph f and T_3 on the same screen.

5. $f(x) = \cos(x)$, $a = \pi/2$

6. $f(x) = \dfrac{\ln(x)}{x}$, $a = 1$

7. $f(x) = xe^{-2x}$, $a = 0$

25. Use the Alternating Series Estimation Theorem or Taylor's Inequality to estimate the range of values of x for which the given approximation is accurate to within the stated error.

$$\arctan x \approx x - \frac{x^3}{3} + \frac{x^5}{5} \quad (|\text{error}| < .05)$$