L1 Homework Problems

1. Solve $\frac{(x^2-1)^{\frac{1}{2}}-(x^2-1)^{-\frac{1}{2}}(2-x^2)}{x^2-1}=0$

2. Solve $|1-4x|-7\leq -2$

3. Solve $\frac{x^2}{2-x}\geq 1$

4. Let $f(x)=\frac{1}{2x-1}$ and $g(x)=\frac{1}{x+2}$. Find $f\circ g$ and its domain.

5. If $f(x)=2x+\ln x$ find $f^{-1}(2)$.

6. Solve $\sin 2x+\sin x=0$ for x on the interval [0,2π)

7. Let $f(x)=\sqrt[5]{3x-1}$ and let $g(x)$ be a one-to-one function with $g^{-1}(5)=2$. If the point (4,-1) lies on the graph of g, find

   a. $g^{-1}(f(0))$

   b. $f^{-1}(-1)+g(4)$

   c. $g(f(11))$

8. Find $\cos(\cos^{-1}(\frac{7\pi}{6}))$

9. Find $\csc(\cos^{-1}(\frac{x}{2}))$

10. T or F: if $f(x)$ is an odd function so that $f(2)=-5$, then $f^{-1}(5)=-2$

11. Graph $f(x)=2-e^{-x}$

12. Graph $f(x)=3+\ln(x+2)$

13. Find the inverse and its domain for $f(x)=\sqrt{2-e^x}$

14. Solve $\log_3 y+3\log_3(y^2)=14$

15. Solve $2\log x-\log(16-2x)=\log 2$

16. Find the domain of $f(x)=\ln(x+1-\frac{12}{x})$

L2 Homework Problems

1. The position function of a ball thrown in the air with a velocity of 40 ft/sec is given by $H(t) = 40t - 16t^2$ where $H(t)$ is the height of the ball above the ground after t seconds. Write an expression for the average velocity of the ball on the time interval $[2, 2+h]$ where $h \neq 0$. Then find the instantaneous velocity of the ball when $t = 2$ (take the limit of your expression from part a. as $h \to 0$)

2. The position of a particle at time t seconds is $s(t) = \frac{1}{2t-1}$ in inches, $t > \frac{1}{2}$. Find the average velocity of the particle on the interval from $t = 1$ to $t = 1 + h$ for $h \neq 0$. Then find the instantaneous velocity of the particle when $t = 1$. Simplify and include units in your answer.

3. The position of a cat in feet after t seconds is given by $s(t) = \sqrt{t+1} - 1$, $t \geq 0$. Find a formula for the average velocity of the cat on the interval from $t = 3$ to $t = 3 + h$ for $h \neq 0$. Then find the instantaneous velocity of the cat when $t = 3$. Simplify and include units in your answer.

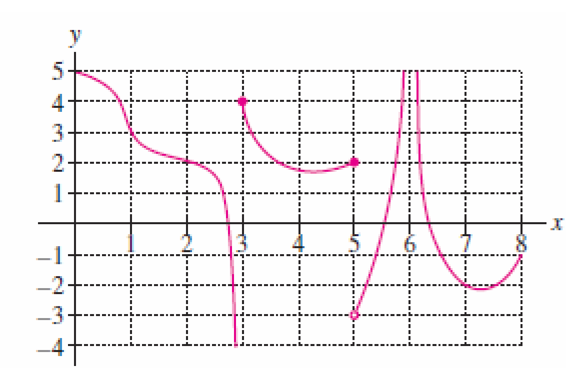
4. A particle moves along a straight path so that its position in feet from an observation point after t minutes is given by $s(t) = -2t^2 + 4t + 5$. Find the average velocity of the particle on the interval from $t = 2$ to $t = 2 + h$ for $h \neq 0$. Then find the instantaneous velocity of the particle when $t = 2$. Simplify and include units in your answer.

5. Let $f(x) = \frac{x^2+x-6}{x-2}$. Fill out the tables to evaluate $\lim_{x \to 2} f(x)$

x	$f(x)$
1.9	
1.99	
1.999	

x	$f(x)$
2.1	
2.01	
2.001	

6. Determine the one- and two-sided limits of $g(x)$ below



a. $\lim_{x \to 3^-} g(x) =$

b. $\lim_{x \to 3^+} g(x) =$

c. $\lim_{x \to 3} g(x) =$

d. $\lim_{x \to 5^-} g(x) =$

e. $\lim_{x \to 5^+} g(x) =$

f. $\lim_{x \to 5} g(x) =$

g. $\lim_{x \to 6^-} g(x) =$

h. $\lim_{x \to 6^+} g(x) =$

i. $\lim_{x \to 6} g(x) =$

L3 Homework Problems

Evaluate the limits if possible

1. $\lim\limits_{x\to 4} \frac{\frac{1}{x}-\frac{1}{x^2-12}}{x-4}$

2. $\lim\limits_{x\to 0} \frac{\sqrt{x+2}-\sqrt{2}}{x}$

3. $\lim\limits_{x\to 3^+} \frac{4-x}{\ln(x-3)}$

4. $\lim\limits_{x\to 3^+} \frac{\ln(x-3)}{4-x}$

5. $\lim\limits_{x\to 0} \frac{x^2-2|x|}{x^2-4x}$

6. $\lim\limits_{x\to 3} \frac{x^2-4x+3}{|3-x|}$

7. $\lim\limits_{x\to 4} \frac{x-4}{\sqrt{x}-\sqrt{8-x}}$

8. $\lim\limits_{x\to 4} \frac{1}{\sqrt{x}-2} - \frac{4}{x-4}$

9. Let f be a one-to-one and continuous function. Which of the following are true?
   a. f^{-1} is one-to-one
   b. f^{-1} is continuous
   c. if $f^{-1}(-1) = 5$ and $f^{-1}(7) = 3$ then, by the Intermediate Value Theorem, f has a root in $[3, 5]$

10. Let $f(x) = \begin{cases} \sin x & x < 0 \\ \log_2(x+1) & 0 < x \leq 3 \\ \frac{1}{x-3} & x > 3 \end{cases}$

Which of the following are true?

a. f has a removable discontinuity at $x = 0$

b. f has a jump discontinuity at $x = 3$

11. Let $f(x) = \begin{cases} \frac{x}{a} & x \leq 2 \\ \frac{\frac{1}{x+1}-\frac{1}{3}}{x-2} & x > 2 \end{cases}$

Find the value of a that will make $f(x)$ continuous at $x = 2$.

12. The Intermediate Value Theorem guarantees a solution to the equation $x^3 - \frac{1}{x} + 3 = 5x$ on which of the following intervals?

$a. [-1, 1] \quad b. [1, 3] \quad c. [3, 5] \quad d. [-3, 2]$

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

a. $\lim_{x \to -1^-} f(x)$

b. $\lim_{x \to -1^+} f(x)$

14.

Let $g(x) = \begin{cases} \frac{1}{x} - 1 & x < -1 \\ \tan(\frac{\pi x}{2}) & -1 < x < 0 \\ 2 + e^{-x} & x > 0 \end{cases}$

Find the following limits:

a. $\lim_{x \to 0^-} g(x) =$ b. $\lim_{x \to 0^+} g(x) =$ c. $\lim_{x \to 0} g(x) =$

d. $\lim_{x \to -1^-} g(x) =$ e. $\lim_{x \to -1^+} g(x) =$ f. $\lim_{x \to 1} g(x) =$

g. $\lim_{x \to -\infty} g(x) =$ h. $\lim_{x \to \infty} g(x) =$

Also, determine the type of discontinuity at $x = 0$ and at $x = -1$.

15. Show that the equation $\cos x = x$ has at least one real root in the interval $(0, 1)$.

16. Show that $f(x) = x^3 + x$ takes on the value of 9 for some x in $[1, 2]$

L4 Homework Problems

Evaluate

1. $\lim\limits_{x\to 2} \frac{\sin(x-2)}{x^2+x-6}$

2. $\lim\limits_{x\to \frac{\pi}{2}} \frac{\cos x}{x-\frac{\pi}{2}}$

3. $\lim\limits_{x\to 0} \frac{1-\cos(4x)}{x^2}$

4. $\lim\limits_{x\to 0} x\sin(\frac{1}{x^2})$

5. $\lim\limits_{x\to 0} \frac{\tan(4x)}{9x}$

6. $\lim\limits_{h\to 0} \frac{\sin(2h)(1-\cos h)}{h^2}$

7. $\lim\limits_{t\to 0} \frac{\sin(7t)}{\sin(3t)}$

8. $\lim\limits_{x\to -\infty} \frac{x}{x-\sqrt{x^2+4}}$

9. $\lim\limits_{x\to -\infty} (x-\sqrt{x^2+2x})$

10. $\lim\limits_{x\to -\infty} \frac{2e^x+1}{e^x-1}$

11. $\lim\limits_{x\to -\infty} \frac{|x|-x}{x^2}$

12. $\lim\limits_{x\to \infty} \ln(\sqrt{9x^2+3})$ -$\ln x$

13. $\lim\limits_{x\to \infty} \frac{x+\sin x}{2x}$

14. $\lim\limits_{x\to \infty} \frac{\sqrt{9x^4+3x^2+2}}{4x^3+1}$

15. Find all horizontal asymptotes of

    a. $f(x) = \frac{x}{2x+\sqrt{x^2-2x}}$

    b. $f(x) = \frac{\sqrt{36x^2+7}}{9x+4}$

    c. $f(t) = \frac{e^t}{1-e^{-t}}$

L5 Homework Problems (some use the following equations)

$$f'(a) = \lim_{h\to 0} \frac{f(a+h)-f(a)}{h} \qquad \text{(equation 1)}$$

$$f'(a) = \lim_{x\to a} \frac{f(x)-f(a)}{x-a} \qquad \text{(equation 2)}$$

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} \qquad \text{(equation 3)}$$

1.-2. Use equations 1 and 2 to compute the derivatives two ways:

1. $f(x) = x^2 + 9x$, $a = 2$
2. $f(x) = 3x^2 + 4x + 2$, $a = -1$

3.-5. Use equation 3 to compute the derivatives

3. $f(x) = 7x - 9$
4. $f(x) = 8 - 3x$
5. $f(x) = x^{-\frac{1}{2}}$

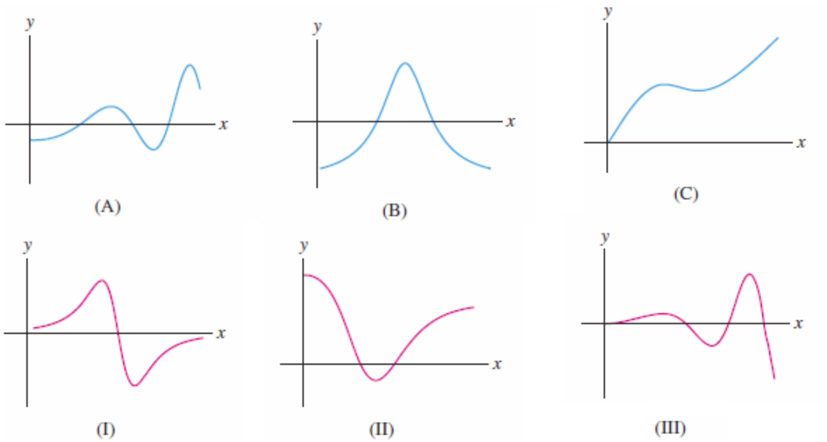
6-8. Use equation 1 or equation 2 to compute $f'(a)$ and find an equation of the tangent line

6. $f(x) = \sqrt{3x+5}$, $a = -1$
7. $f(x) = \frac{1}{x^2+1}$, $a = -1$
8. $f(x) = \frac{2}{1-t}$, $a = 0$

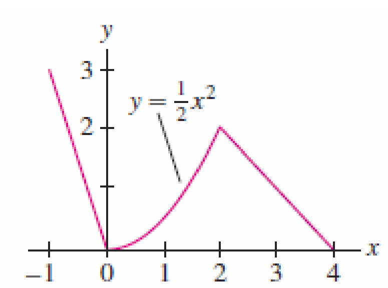
9.-10. Each limit represents a derivative $f'(a)$. Find $f(x)$ and a.

9. $\lim_{h\to 0} \frac{\sin(\frac{\pi}{6}+h)-\frac{1}{2}}{h}$
10. $\lim_{x\to 5} \frac{x^3-125}{x-5}$

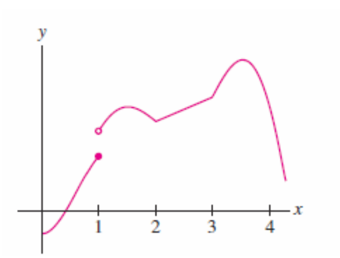
11. Match functions (A)-(C) with their derivatives (I)-(III).



12. Sketch a graph of the derivative of the function below:



13. Determine where the function is discontinuous or nondifferentiable



14.-15. Find the points c such that $f'(c)$ does not exist

14. $f(x) = x^{\frac{2}{3}}$

15. $f(x) = |x^2 - 1|$

L6 Homework Problems

Calculate the derivatives

1. $f(t) = t^{-\pi^2}$

2. $f(x) = x^{\frac{5}{4}} + 4x^{\frac{3}{2}} + 11x$

3. $f(x) = \sqrt[4]{s} + \sqrt[3]{s}$

4. $s(t) = \frac{1-2t}{t^{\frac{1}{2}}}$

5. $f(t) = e^{t-3}$

6. $h(t) = 6\sqrt{t} + \frac{1}{t}$

7. $P(s) = (4s - 3)^2$

8. $f(y) = 9c^2y^3 - 24c$ where c is a constant

9-10. Find an equation of the tangent line at $x = a$.

9. $f(x) = x^{-2}$, $a = 5$

10. $f(x) = \sqrt[3]{x}$, $a = 8$

11. -13. Use the product rule to calculate the derivative

11. $f(x) = (2x - 9)(4e^x + 1)$

12. $y = (t - 8t^{-1})(e^t + t^2)$

13. $y = e^{2x}$

14. -17. Use the quotient rule to calculate the derivative

14. $w(z) = \frac{z^2}{\sqrt{z}+z}$

15. $f(x) = \frac{e^x}{x^2+1}$

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

17. $f(x) = \frac{ax+b}{cx+d}$

L7 Homework Problems

Compute the derivatives

1. $f(x) = 9\sec x + 12\cot x$
2. $f(t) = \tan t \csc t$
3. $f(x) = \frac{1+\tan x}{1-\tan x}$
4. $f(x) = \frac{3\cos x - 4}{\sin x}$
5. $y = \csc x - \cot x$
6. $y = x \tan x \sec x$
7. $y = \cos(9t + 41)$
8. $y = (\frac{x+1}{x-1})^4$
9. $y = \cos^3(e^{4\theta})$
10. $y = \sin(x^2)\cos(x^2)$
11. $y = \sin(\cos(\sin x))$
12. $y = \tan^3 x + \tan(x^3)$
13. $y = (1 + \cot^5(x^4 + 1))^9$
14. $y = \sec(\sqrt{t^2 - 9})$
15. $y = \sqrt{\frac{z+1}{z-1}}$
16. $y = \frac{(x+1)^{\frac{1}{2}}}{x+2}$
17. Write the equations of the tangent and normal lines to $f(x) = \frac{\sqrt{x}+1}{x-1}$ at $x = 4$

L8 Homework Problems

1.- 5. Find the rates of change

1. Area of a square with respect to its side s when s = 5.

2. Volume of a cube with respect to its side s when s = 5.

3. The diameter of a circle with respect to radius.

4. Surface area A of a sphere with respect to radius r $\quad (A = 4\pi r^2)$.

5. Volume V of a cylinder with respect to radius if the height is equal to the radius.

6. A particle's position function is given by $s(t) = \frac{1}{3}t^3 - 2t^2 + 3t + 5$, where s is in inches and t is in seconds.

   a. Find the total distance traveled by the particle from time $t = 0$ to $t = 2$.

   b. When is the partcle speeding up?

   c. When is the particle slowing down?

7. The position (in centimeters) of a particle moving in a straight line at time t (in seconds) is given by $s(t) = t^3 - 6t^2 + 9t$ for $0 \leq t \leq 6$

   a. Find the velocity function $v(t)$.

   b. At what time(s) is the particle at rest?

   c. Find the displacement at $t = 6$ seconds

   d. Find each interval on which the particle is speeding up

   e. Find each interval on which the particle is slowing down.

8.-10. Calculate y'' and y'''

8. $y = 20t^{\frac{4}{5}} - 6t^{\frac{2}{3}}$

9. $y = \frac{x-4}{x}$

10. $y = s^{-\frac{1}{2}}(s+1)$

L9 Homework Problems

1. - 3. Differentiate with respect to x.

1. $3y^3 + x^2 = 5$

2. $y^4 - 2y = 4x^3 + x$

3. $x^4 + y^4 = 1$

4. - 5. Find an equation of the tangent line at the given point

4. $xy + x^2y^2 = 5$, $(2, 1)$

5. $\sin(x - y) = x\cos(y + \frac{\pi}{4})$, $(\frac{\pi}{4},\ \frac{\pi}{4})$

6. - 7. Calculate $g'(x)$ where $g(x)$ is the inverse of $f(x)$

6. $f(x) = \sqrt{3 - x}$

7. $f(x) = x^{-5}$

8. - 14. Find the derivative

8. $y = \sin^{-1}(7x)$

9. $y = \tan^{-1}(\frac{x}{3})$

10. $y = \cos^{-1}(x^2)$

11. $y = e^{(\ln x)^2}$

12. $y = (\ln(\ln x))^3$

13. $y = \frac{2^x - 3^{-x}}{x}$

14. $y = 16^{\sin x}$

15. - 17. Find the derivative using logarithmic differentiation

15. $y = \frac{x(x^2+1)}{\sqrt{x+1}}$

16. $y = (3x + 5)(4x + 9)$

17. $y = \frac{(x+1)^2(2x^2-3)}{\sqrt{x^2+1}}$

L10 Homework Problems

1. - 2. Use $\triangle f \approx f'(a)\triangle x$ to estimate $\triangle f = f(3.02) - f(3)$

1. $f(x) = x^2$

2. $f(x) = x^4$

3. Use $\triangle f \approx f'(a)\triangle x$ to estimate $\triangle f$ for $f(x) = \sqrt{1+x}$, $a = 3$, $\triangle x = 0.2$

4. Estimate $\triangle y \approx dy$ using differentials: $y = \tan^2 x$, $a = \frac{\pi}{4}$, $\triangle x = -0.02$

5. - 6. Estimate using the linear approximation $L(x) = f'(a)(x-a) + f'(a)$

5. $\sqrt{26} - \sqrt{25}$

6. $9^{\frac{1}{3}} - 2$

7. - 8. Find critical numbers

7. $f(x) = x^3 - \frac{9}{2}x^2 - 54x + 2$

8. $f(x) = x^2\sqrt{1-x^2}$

9. - 11. Find min and max values on the interval given

9. $y = 2t^3 + 3t^2$ on [1,2]

10. $y = \sin x \cos x$ on $[0,\ \frac{\pi}{2}]$

11. $y = \frac{1-x}{x^2+3x}$ on [1,4]

12. - 13. Verify Rolle's Theorem on the interval

12. $f(x) = x + x^{-1}$ on $[\frac{1}{2},\ 2]$

13. $f(x) = \sin x$ on $[\frac{\pi}{4},\ \frac{3\pi}{4}]$

L11 Homework Problems

1. - 2. Find a point c satisfying the conclusion of the Mean Value Theorem for the given function and interval

1. $y = \sqrt{x}, \quad [9,\ 25]$

2. $y = x^3, \quad [-4,\ 5]$

3.-8 Find critical points and intervals where the function is increasing or decreasing. Use the first derivative test to determine whether the critical point is a local min, local max, or neither.

3. $y = -x^2 + 7x - 17$

4. $y = x^3 - 12x^2$

5. $y = x^5 + x^3 + 1$

6. $y = \frac{x^3}{x^2+1}$

7. $y = \sin^2 x + \sin x$

8. $y = x^2 e^x$

9. Find extreme values of $f(x) = xe^{-x}$ on [0,2]

10. Find extreme values of $f(x) = x^2 - 4x + 1$ on [0,1]

L12 Homework Problems

1.-3. Find intervals where the function is concave up or concave down and find inflection points

1. $y = x^2 - 4x + 3$

2. $y = x^{\frac{7}{2}} - 35x^2$

3. $y = xe^{-3x}$

4.-6. Find critical points, inflection points, intervals where the function is concave up or down, local minima, and local maxima

4. $f(x) = x^3 - 2x^2 + x$

5. $f(x) = x^2(x-4)$

6. $f(x) = x^2 - x^3$

7-10. Sketch the graph from the following information: critical points, inflection points, intervals of inrease/decrease, intervals of concave up/concave down, local minima and maxima, x- and y-intercepts, horizontal and vertical asymptotes

7. $y = x^3 + 24x^2$

8. $y = x - 4\sqrt{x}$

9. $y = \frac{3x+2}{2x-4}$

10. $y = \frac{x}{x^2-1}$

L13 Homework Problems

Related Rates Problems

1. A balloon rises at a rate of 3 meters per second from a point on the ground 30 meters from an observer. Find the rate of change of the angle of elevation of the balloon from the observer when the balloon is 30 meters above the ground.

2. The radius of a sphere is increasing at a rate of 3 in/min. Find the rates of change of the volume when r = 9 inches.

3. At a sand plant, sand is falling off a conveyor and onto a conical pile at a rate of 10 cubic feet per minute. The diameter of the base of the cone is three times its height. At what rate is the height of the pile changing when the pile is 15 feet high?

4. A ladder 25 feet long is leaning against the wall of a house. The base of the ladder is pulled away from the wall at a rate of 2 ft/sec. How fast is the top of the ladder moving down the wall when its base is 7 feet from the wall?

5. The radius of a circular oil spill is increasing at a constant rate of 1.5 meters per second. How fast is the area of the spill increasing when the radius is 30 meters?

6. Boyle's Law states that when a sample of gas is compressed at constant temperature the product of the pressure and the volume remains constant. At a certain instant, the volume of a gas is 600 cubic centimeters, the pressure is 150 kPa, and the pressure is increasing at a rate of 20 kPa per minute. How fast is the volume decreasing at this instant?

Optimization Problems

7. You are asked to design a cylindrical can (with top and bottom) of volume 500 cubic centimeters. What dimensions should the can have in order to minimize the amount of metal used?

8. A box with no top is to have volume 4 cubic meters, and its base is to be a rectangle twice as long as it is wide. If the material for the bottom costs $3 per square meter and the material for the sides costs $1.50 per square meter, find the dimensions that minimize the total cost of constructing the box.

9. Find the dimensions of the rectangle of maximum area that can be inscribed in a circle of radius 4.

10. Find the point on the line $6x + y = 9$ that is closest to the point (-3,1).

L14 Homework Problems

1. $\lim\limits_{x\to 0} \frac{x^3}{\sin x - x}$

2. $\lim\limits_{x\to 0} x \sin \frac{1}{x}$

3. $\lim\limits_{x\to \infty} \frac{x^2}{e^x}$

4. $\lim\limits_{x\to 4} (\frac{1}{\sqrt{x}-2} - \frac{4}{x-4})$

5. $\lim\limits_{x\to \frac{\pi}{2}} \frac{\tan 4x}{\tan 5x}$

6. $\lim\limits_{x\to 0} (\cot x - \frac{1}{x})$

7. $\lim\limits_{x\to 0} \frac{x^2}{1-\cos x}$

8. $\lim\limits_{x\to \infty} x^{\frac{1}{x^2}}$

9. $\lim\limits_{x\to 0} x^{\sin x}$

10. $\lim\limits_{x\to \infty} (\frac{x}{1+x})^x$

11. $\lim\limits_{x\to 0} \frac{\tan^{-1} x}{\sin^{-1} x}$

12. $\int 9x + 2 \, dx$

13. $\int t^{-\frac{6}{11}} \, dt$

14. $\int (\frac{1}{3}\sin x - \frac{1}{4}\cos x)\, dx$

15. $\int (\theta + \sec^2\theta)\, d\theta$

16. $\int \csc t \cot t\, dt$

17. $\int \frac{dx}{x^{\frac{4}{3}}}$

18. $\int 12 \sec x \tan x\, dx$

19. $\int \frac{x^3+3x-4}{x^2}\, dx$

20.$\int \frac{12-z}{\sqrt{z}}\, dz$

L15 Homework Problems

1. Calculate R_3 and L_3 for $f(x) = x^2 - x + 4$ over $[1,\ 4]$

2. Calculate the sum $\sum_{j=0}^{50} j(j-1)$

3. Evaluate the limit $\lim_{N\to\infty} \sum_{j=1}^{N} \frac{j^3}{N^4}$

4. Evaluate the limit $\lim_{N\to\infty} \sum_{j=1}^{N} \frac{j^2-j+1}{N^3}$

5. Evaluate the limit $\lim_{N\to\infty}$ for the area under the graph of $f(x) = 6x^2 - 5$ over [2,5]

6. Evaluate the limit $\lim_{N\to\infty}$ for the area under the graph of $f(x) = x^3 - x$ over [0,2]

7. Sketch the signed areas represented by the integral. Indicate regions of positive and negative area

$\int_{-2}^{1} (3x+4)\, dx$

8. Determine the sign of the integral without evaluating it. You probably need to sketch the function to see its behavior.

$\int_{-2}^{1} x^4\, dx$

9. Ue properties of the integral and formulas to calculate

$\int_0^4 (6t-3)\, dt$

10. $\int_0^9 x^2\, dx$

L16 Homework Problems

Evaluate the integrals using FTC 1.

1. $\int_3^6 x\,dx$

2. $\int_0^4 \sqrt{x}\,dx$

3. $\int_1^3 \frac{dt}{t^2}$

4. $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \sin\theta\,d\theta$

5. $\int_1^9 t^{-\frac{1}{2}}\,dt$

Calculate the derivatives

6. $\frac{d}{dx}\int_0^{x^2} \frac{t\,dt}{t+1}$

7. $\frac{d}{dx}\int_1^{\frac{1}{x}} \cos^3 t\,dt$

8. $\frac{d}{dx}\int_{x^2}^{x^4} \sqrt{t}\,dt$

9. Water flows into an empty reservoir at a rate of $3000 + 20t$ liters per hour. What is the quantity of water in the reservoir after 5 hours?

10. A factory produces bicycles at a rate of $95 + 3t^2 - t$ bicycles per week. How many bicycles were produced from the beginning of week 2 to the end of week 3?

11. A cat falls from a tree (with zero initial velocity) at time $t = 0$. How far does the cat fall between $t = 0.5$ and $t = 1$ s? Use Galileo's formula $v(t) = -9.8t$ m/s.

L17 Homework Problems

1. $\int (9t+2)^{\frac{2}{3}}\,dt$

2. $\int \frac{5x^4+2x}{(x^5+x^2)^3}\,dx$

3. $\int \frac{x}{\sqrt{x^2+9}}\,dx$

4. $\int (3x+8)^{11}\,dx$

5. $\int x(3x+8)^{11}\,dx$

6. $\int \theta\sin(\theta^2)\,d\theta$

7. $\int \tan(4\theta+9)\,d\theta$

8. $\int \sin(4x)\sqrt{\cos(4x)+1}\,dx$

9. $\int \cos t \cos(\sin t)\,dt$

10. $\int \frac{dx}{x(\ln x)^2}$

11. $\int \frac{e^t\,dt}{e^{2t}+2e^t+1}$

12. $\int (\sec^2 t)e^{\tan t}\,dt$

13. $\int_1^6 \sqrt{x+3}\,dx$

14. $\int_0^1 \frac{x}{(x^2+1)^3}\,dx$

15. $\int_0^1 (x+1)(x^2+2x)^5\,dx$

16. $\int_0^{\frac{1}{2}} \frac{dx}{\sqrt{1-x^2}}$

17. $\int_0^4 \frac{dt}{4t^2+9}$

18. $\int_1^{\sqrt{3}} \frac{\tan^{-1} x\,dx}{1+x^2}$

19. $\int_0^1 3^{-x}\,dx$

20. $\int_0^1 t5^{t^2}\,dt$