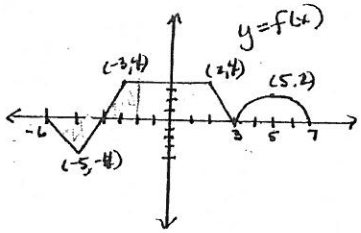
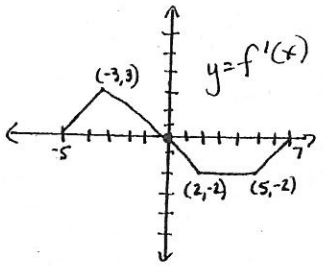
Review Ch 4



Let $g(x) = \int_{-2}^{x} f(x)\,dx$. Find the following:

1. $g(3)$ 2. $g(-6)$ 3. $g(5)$
4. $g'(-5)$ 5. $g''(1)$ 6. $g''(-4)$
7. Where is $g(x)$ decreasing?
8. Where is $g(x)$ concave up?
9. Find the max & min values of $g(x)$ on $[-6,7]$.



The graph is of $f'(x)$. Find the following if $f(2)=4$.

10. $f(5)$ 11. $f(-5)$ 12. $f''(6)$
13. Where is $f(x)$ increasing?
14. Where if $f(x)$ concave down?
15. Find the max & min values of $f(x)$ on $[-5,7]$

Let $\int_2^6 f(x)\,dx = 10$, $\int_2^{10} f(x)\,dx = 12$, $\int_2^6 g(x)\,dx = -3$

16. $\int_6^{10} f(x)\,dx$ 17. $\int_2^6 [2f(x) - g(x)]\,dx$ 18. $\int_{10}^{2} 3f(x)\,dx$

19. $\int_2^6 [f(x) - 4]\,dx$ 20. $\int_5^{13} f(x-3)\,dx$ 21. Avg value of $g(x)$ on $[2,6]$.

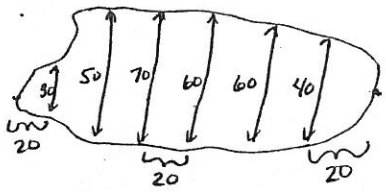
Determine the following:

22. $\int \frac{(x^2-1)^2}{x^2}\,dx$ 23. $\int \frac{\csc x \cos x}{\sin x}\,dx$ 24. $\int_0^3 \sqrt{9-x^2}\,dx$

25. $\int_{-2}^{4} |x-1|\,dx$ 26. $\int_0^{\pi/3} \frac{\sin x}{\cos^2 x}\,dx$ 27. $\int_0^{-1} \frac{x^3+8}{x+2}\,dx$ 28. $\int_1^0 s^2\left(\sqrt[3]{s} - \sqrt{s}\right) ds$

29. $\frac{d}{dx}\int_{\sqrt{x}}^{x^3} \sin^2 t \cos t\,dt$ 30. $\frac{d}{dx}\int_4^7 \sqrt[3]{t^2 - t}\,dt$ 31. Find the average value of $f(x) = 2 + 3\sqrt{x}$ on $[1,4]$ & find x value to satisfy MVT for int.

32. A man-made lake has the shape shown with adjacent measurements 20 feet apart. Use the trapezoidal rule to approximate the average distance across the lake.



33. If $f(x) = 16 - x^2$, approx $\int_0^3 f(x)\,dx$ using ⓐ LRAM ⓑ RRAM ⓒ MRAM with 6 subintervals of equal width

34. The velocity of a bicycle was taken at different times

t (sec)	0	10	15	25	30	40
V(t) ft/sec	20	22	30	26	18	20

a) Approx. the distance travelled from $[0,40]$ using 5 right-hand rectangular approximations.

b) Approx the distance travelled from $[0,40]$ sec using trapezoid.

c) Explain why there must be at least one time on $[0,40]$ when acceleration = 0.

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ans: 1. 18 2. -2 3. $18+\pi$ 4. -4 5. 0 6. 4 7. $(-6,-4)$ 8. $(-5,-3)\cup(3,5)$ 9. max: $18+2\pi$ min: -6
10. -2 11. $-\frac{3}{2}$ 12. 1 13. $(-5,0)$ 14. $(-3,2)$ 15. min: -6 max: 6 16. 2 17. 23 18. -36
19. -6 20. 12 21. $-\frac{3}{4}$ 22. $\frac{1}{3}x^3 - 2x - \frac{1}{x} + c$ 23. $-\csc x + c$ 24. $\frac{9}{4}\pi$ 25. 9
26. 1 27. $-\frac{16}{3}$ 28. $-\frac{1}{10}$ 29. $3x^2\sin^2 x^3\cos x^3 - \frac{1}{2\sqrt{x}}\sin^2\sqrt{x}\cos\sqrt{x}$ 30. 0 31. $\frac{20}{3}$
32. 444.2816 ft 33. 4) 411.25 b) 36.625 c) 39.0625 $c = \frac{196}{81}$
34. a) 920 ft b) 920 ft c) By MVT, $a(t) = v'(t) = \frac{v(40)-v(0)}{40-0} = \frac{20-20}{40} = 0$ on $[0,40]$
So there is at least one time in $[0,40]$ where $a(t)=0$

Extra Practice - Chapter 4

Solve the differential equations:

1. $f''(x) = 5\cos x + 2\sin x \quad f(0) = 3 \quad f'(0) = 4$

2. $f'(x) = 6x^2 + x - 5 \quad f(0) = 2$

3. A stone is thrown upward from a position 144 ft above the ground with a velocity of 96 ft/sec. Find
   a) the stone's distance above ground at time t
   b) when and with what velocity the stone strikes the ground

Evaluate the following:

4. $\int_{-2}^{3} |x| + 2 \, dx$

5. $\int_{-3}^{0} \sqrt{9 - x^2} \, dx$

6. $\int \frac{1}{\cos x \cot x} \, dx$

7. $\int \frac{(x^2 - 1)^2}{x^2} \, dx$

8. $\int_{-1}^{1} \frac{x^3 + 3x^2 - 9x - 2}{x - 2} \, dx$

9. $\frac{d}{dx} \int_{\sqrt{x}}^{3} t^2 \sin t \, dt$

10. $\frac{d}{dx} \int_{x^3}^{\sec x} t\sqrt{1 - t^2} \, dt$

11. Find the average value of $f(x) = 3x^2 - 2x + 3$ on $[-1, 3]$ and find the value of c to satisfy MVT for integrals.

12. Find the average value of $y = 2 + 3\sqrt{x}$ on $[1, 4]$ and find the value of c to satisfy MVT for integrals.

13. Given $f(x) = \frac{1}{x}$, approximate $\int_1^4 f(x) \, dx$ using 6 subintervals
    a) LRAM b) RRAM c) MRAM d) Trapezoidal Rule