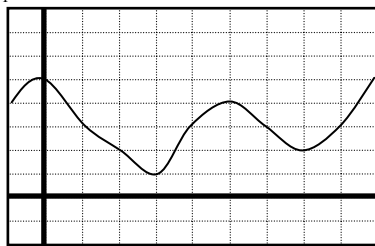


Unit 10 Review – Trig Stuff, Trapezoidal Rule and L'Hospitals Rule

1. Consider the function whose graph is shown below. Use the trapezoidal rule with $n=4$ to estimate the value of $\int_1^9 f(x)dx$.



2. The following table lists the known values of a function f .

| | | | | | |
|--------|---|-----|-----|-----|-----|
| x | 1 | 2 | 3 | 4 | 5 |
| $f(x)$ | 0 | 1.1 | 1.4 | 1.2 | 1.5 |

If the trapezoidal rule is used to approximate $\int_1^5 f(x)dx$ the result is?

3. If the definite integral $\int_0^2 e^{x^2} dx$ is approximated using 2 methods: 1) using 2 inscribed rectangles of equal width and then 2) using the trapezoidal rule with $n=2$, the *difference* between the two approximates is?
4. If $f'(x)=\cos x$ and $g'(x)=1$ for all x , and if $f(0) = g(0) = 0$, then $\lim_{x \rightarrow 0} \frac{f(x)}{g(x)}$ is?

5. $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3} =$

6. $\lim_{h \rightarrow 0} \frac{3\left(\frac{1}{2} + h\right)^5 - 3\left(\frac{1}{2}\right)^5}{h} =$

Find the derivatives:

7. $y = \ln(\cos^3(3x))$

8. $y = (x^2 + 1)\sec x$

9. $y = \sqrt{\cos(5x)}$

10. $y = (1 + \sec^3(x))^{10}$

11. $h(x) = \sqrt{1-x^2} \arcsin x$

12. $y = \arctan(\cos \theta)$

13. $y = \tan^{-1}(x - \sqrt{1+x^2})$

Find all the points where the graph of f has a horizontal tangent: Use $0 \leq x < 2\pi$.

14. $y = \csc x$

15. $y = x + \cot x$

16. $y = x - \cos 2x$

17. Find the equation of the tangent line to the graph of $y = \sin x$ at $x = \pi$.

18. Find the equation of the tangent line to the graph of $y = 4 + \cot x - 2 \csc x$ at $\left(\frac{\pi}{2}, 2\right)$.

19. Find the equation of the tangent line to the graph of $y = 1 + \sqrt{2} \csc x + \cot x$ at $\left(\frac{\pi}{4}, 4\right)$.

Find the Integrals:

20. $\int x^3 \cos(2x^4 - 1) dx$

21. $\int (1 + \sin x)^9 \cos x dx$

22. $\int \sec 4x \tan 4x dx$

23. $\int \tan^3 5x \sec^2 5x dx$

24. $\int 5^{\cot x} \csc^2 x dx$

25. $\int \frac{\sin 3x}{1 + \cos 3x} dx$

Evaluate the Definite Integrals

26. $\int_0^{\pi/3} 4 \sec x \tan x dx$

27. $\int_{\pi/4}^{\pi/2} \cot x \csc^2 x dx$

28. $\int_0^{\pi/2} \frac{\sin x}{(3 + 2 \cos x)^2} dx$

29. $\int_{\pi/4}^{\pi/2} (1 + e^{\cot x}) \csc^2 x dx$

30. $\int_{-\pi/2}^{\pi/6} \frac{\cos x}{1 - \sin x} dx$

Find the Anti-Derivatives

31. $y' = \frac{1}{\sqrt{9 - x^2}}$

32. $y' = \frac{1}{\sqrt{1 - 4x^2}}$

33. $y' = \frac{3}{4 + 9x^2}$

Answer Key

1. 22

2. 4.45

3. 26.799075

4. 1

5. $\frac{1}{2}$

6. 15/16

7. $y' = -9 \tan(3x)$

8. $y' =$

$2x \sec x + (x^2 + 1) \sec x \tan x$

9. $y' = \frac{-5 \sin(5x)}{2\sqrt{\cos(5x)}}$

10.

$30(1 + \sec^3 x)^9 \sec^3 x \tan x$

11. $y' = 1 - \frac{x \arcsin x}{\sqrt{1 - x^2}}$

12. $y' = \frac{-\sin \theta}{1 + \cos^2 \theta}$

13. $y' = \frac{1}{2(1 + x^2)}$

14. $\frac{\pi}{2}, \frac{3\pi}{2}$

15. $\frac{\pi}{2}, \frac{3\pi}{2}$

16.

$\frac{7\pi}{12}, \frac{11\pi}{12}, \frac{19\pi}{12}, \frac{23\pi}{12}$

17. $y = -(x - \pi)$

18. $y - 2 = -\left(x - \frac{\pi}{2}\right)$

19. $y - 4 = -4\left(x - \frac{\pi}{4}\right)$

20. $\frac{1}{8} \sin(2x^4 - 1) + C$

21. $\frac{(1 + \sin x)^{10}}{10} + C$

22. $\frac{1}{4} \sec 4x + C$

23. $\frac{1}{20} \tan^4(5x) + C$

24. $-\frac{5^{\cot x}}{\ln 5} + C$

25. $-\frac{1}{3} \ln|1 + \cos 3x| + C$

26. 4

27. $\frac{1}{2}$

28. $\frac{1}{15}$

29. e

30. $\ln 4$

31. $y = \sin^{-1}\left(\frac{x}{3}\right) + C$

32. $y = \frac{1}{2} \sin^{-1}(2x) + C$

33. $y = \frac{1}{2} \tan^{-1}\left(\frac{3x}{2}\right) + C$