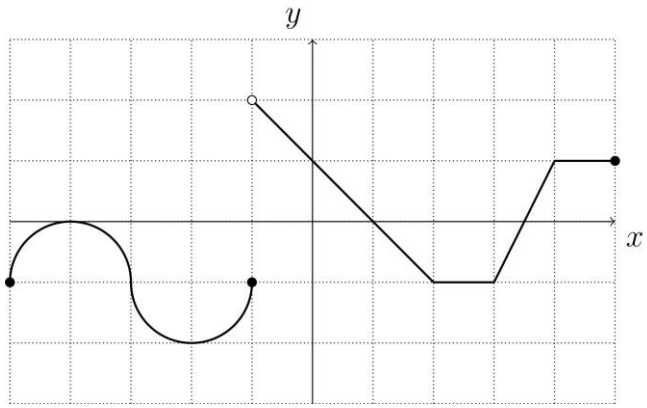
1. Evaluate the following integrals
   a. $\int \frac{2\sqrt{t}-3^t\ t^2+(2t-1)^2}{t^2}\,dt$
   b. $\int_{-2}^{3} 2|x-1|\,dx$
   c. $\int_{0}^{\pi/4} \frac{4x+1}{\sec(3x)}\,dx$
   d. $\int \frac{x^3-4x^2+5}{x-1}\,dx$
   e. $\int_{e}^{e^2} \frac{3}{x\,(\ln x)^4}\,dx$
   f. $\int \frac{3x^2\sec(2x)-4\tan(2x)}{\sec(2x)}\,dx$
   g. $\int \frac{5x^2-3x+2}{x^2(x-1)}\,dx$
   h. $\int (x^2-2)e^{-2x}dx$
2. Given $f''(x)=60\sqrt{x}-48x$; $f(1)=9$; $f(0)=-6$, find $f(x)$
3. Use the graph of $f(x)$ to evaluate the definite integrals:



   a. $\int_{3}^{0} 2f(x)-5\,dx$
   b. $\int_{-1}^{5} f(x)\,dx$
   c. $\int_{-4}^{-1} f(x)\,dx$
4. The marginal cost for producing x bumper stickers for the local Math Club is given by $\frac{dC}{dx}=\frac{3}{\sqrt{x}}+1$. It costs \$42 to produce the first 9 stickers.
   a. Find the cost function C(x).
   b. What is the cost for producing 64 stickers for the Math Club ?
5. Consider the functions $f(x)=x^3+7x^2-4$ and $g(x)=x+3$.
   a. Find the points of intersection of the graphs of f and g.
   b. Setup **do not calculate** the definite integral representing the area of the region bounded by the graphs of f and g.
6. Given the demand function $p(x)=\frac{40-x^2}{2}$ and the supply function $p(x)=3x+12$
   a. Find the equilibrium point.
   b. Sketch and identify the regions representing the consumer and producer surpluses.

c. Calculate the consumer surplus.

7. Use Trapezoid rule with $n = 4$ to estimate $\int_0^4 \frac{10}{\sqrt{x^3+8}}\,dx$. Your answer should be correct to 4 decimal places.
8. Find the function y that satisfies the differential equation $-y' + 6e^{y} = 4e^{2x+y}$ and passes through the point $(0,0)$.
9. A company's production N is increasing at a rate proportional to the product of the number N of units and the square of the time t in years. Initially, 8 units are produced. In one year, 16 units are expected. After two years, what will be the production?

10. Evaluate the limits using l'Hopital's Rule.
    a. $\lim_{x\to 0} \frac{2x-\sin(2x)}{x-\sin(x)}$
    b. $\lim_{x\to \pi} \frac{3\sin(x)+2\tan(3x)}{4\tan(2x)-x+\pi}$
11. Evaluate the improper integrals.
    a. $\int_1^2 \frac{2x^2+1}{(2x^3+3x-5)^3}\,dx$
    b. $\int_{-\infty}^0 \frac{e^{3x}}{(3-e^{3x})^2}\,dx$
12. Find a formula for the n^{th} term of the sequence $\left\{-\frac{5}{7},\frac{10}{13},-\frac{20}{19},\frac{40}{25},-\frac{80}{31}\right\}$
13. Determine whether the following sequences converge or diverge. If a sequence converges, find its limit. If sequence diverges, explain why.
    a. $a_n = \frac{(-1)^n(1-n)}{n^2+3}$
    b. $a_n = \frac{3^n+7}{n+1}$
14. Given $a_n = \frac{7n^2(2n+1)!}{(2n+3)!}$
    a. Does the sequence converge? Justify your answer
    b. Does $\sum_{n=1}^{\infty} a_n$ converge?
15. Determine whether the following series converge or diverge. Identify which test you are using. In case of a convergent geometric or telescoping series, find the sum of the series.
    a. $\sum_{n=0}^{\infty} \frac{2^{n+1}+3^n}{7^n}$
    b. $\sum_{n=2}^{\infty} \frac{1}{n^2-1}$

c. $\sum_{n=1}^{\infty} (-1)^n \frac{n^2}{5^{n+2}}$

d. $\sum_{n=2}^{\infty} \frac{n^{2.5}}{\sqrt{n}}$

16. John wants to give his daughter $25,000 in 8 years to start her own business. How much should he invest monthly today at an annual interest rate of 2% compounded monthly to have the $25000 in 8 years?

Answers

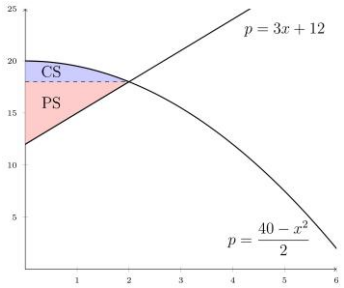
1. (a) $-\frac{4}{\sqrt{t}}-\frac{3^t}{\ln 3}+4t-\frac{1}{t}-4\ln|t|+c$ (b)13 (c)0.2175 (d) $\frac{x^3}{3}-\frac{3x^2}{2}-3x+2\ln|x-1|+c$

(e) $\frac{7}{8}$ (f) $x^3+2\cos(2x)+c$ (g) $\ln|x|+\frac{2}{x}+4\ln|x-1|+c$ (h) $-\frac{1}{4}e^{-2x}\left(2x^2+2x-3\right)+c$

2. $f(x)=16x^{5/2}-8x^3+7x-6$ 3.(a)17 (b) $\frac{3}{2}$ (c) $-\left(\frac{\pi}{4}+3\right)$

4. $C(x)=6\sqrt{x}+x+15$ (b)\$127 5.(a) $\pm 1,-7$ b) $\int_{-7}^{-1}\left(x^3+7x^2-x-7\right)dx+\int_{-1}^{1}\left(x+7-x^3-7x^2\right)dx$

6. (a) $(2,18)$ b)



(c)consumer surplus $\frac{8}{3}$

7. 9.8807 8. $y=-\ln\left(2e^{2x}-6x-1\right)$

9. $N=2048$ 10. (a)8 (b) $\frac{3}{7}$ 11.(a) diverges (b) $\frac{1}{18}$

12. $(-1)^n 5\frac{2^{n-1}}{6n+1}$ 13.(a)converges to 0 (b)Diverges

14.(a) converges to $\frac{7}{4}$ (b) no, it diverges by divergence test

15.(a)convergent geometric series , sum= $\frac{91}{20}$ (b) convergent Telescoping series , sum= $\frac{3}{4}$

(c) converges by Ratio test d) divergent p series or the Nth term test.

16. \$239.96