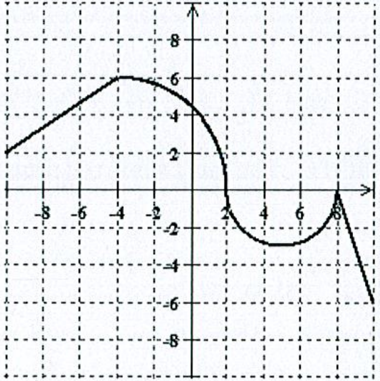
The graph of function f is shown on the right. **SCORE: _____ / 4 PTS**

<u>The graph consists of a diagonal line, arcs of 2 circles, then another diagonal line.</u>



[a] Evaluate $\int_{-10}^{10} f(x)\,dx$.

<u>NOTE: You must show the arithmetic expression that you used to get your answer.</u>

$\frac{1}{2}$ $\underbrace{\frac{2+6}{2}\cdot 6}$ + $\frac{1}{2}$ $\underbrace{\frac{1}{4}\pi(6)^2} - \underbrace{\frac{1}{2}\pi(3)^2} - \underbrace{\frac{1}{2}\,2\cdot 6}$

$= 4\cdot 6 + 9\pi - \frac{9}{2}\pi - 6$ $\frac{1}{2}$ $\frac{1}{2}$

$= \underline{18 + \frac{9}{2}\pi}$ $\frac{1}{2}$

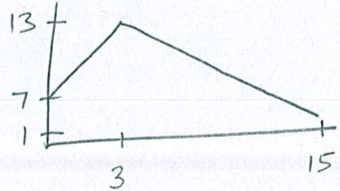
[b] Evaluate $\int_{\cancel{6}\,8}^{-10} f(x)\,dx$.

$-\int_{-10}^{8} f(x)\,dx = -\left[4\cdot 6 + 9\pi - \frac{9}{2}\pi\right] = -\left(24 + \frac{9}{2}\pi\right) = -24 - \frac{9}{2}\pi$

1 $\frac{1}{2}$

A person's velocity (in meters per second) at time t (in seconds) is given by $v(t) = \begin{cases} 2t+7, & 0 \le t \le 3 \\ 16-t, & 3 \le t \le 15 \end{cases}$. **SCORE: _____ / 5 PTS**

[a] Find the exact distance the person travelled from time $t = 0$ seconds to $t = 15$ seconds.
**NOTE: You must show the arithmetic expression that you used to get your answer.
You may only use techniques discussed in sections 5.1 and 5.2.**



$\frac{1}{2}$ $\underbrace{\frac{7+13}{2}\cdot 3}$ $+$ $\underbrace{\frac{13+1}{2}\cdot 12}$ $\frac{1}{2}$

$= 10\cdot 3 + 7\cdot 12$

$= 30 + 84 = \underbrace{114}_{\frac{1}{2}}$ $\underbrace{\text{METERS}}_{\frac{1}{2}}$

[b] Estimate the distance the person travelled from time $t = 0$ seconds to $t = 15$ seconds using three subintervals and left endpoints.
NOTE: You must show the arithmetic expression that you used to get your answer.

$\Delta t = \frac{15-0}{3} = 5$

$v(0)\Delta t + v(5)\Delta t + v(10)\Delta t$

$= 7\cdot 5 + 11\cdot 5 + 6\cdot 5$

$= 1\frac{1}{2}$ $\underbrace{(7+11+6)}\cdot\underbrace{5}$ $\frac{1}{2}$

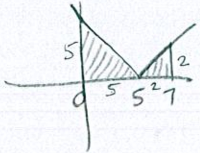
$= 24\cdot 5 = \underbrace{120}_{\frac{1}{2}}$ $\underbrace{\text{METERS}}_{\frac{1}{2}}$

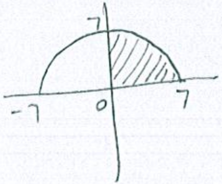
Evaluate $\int_0^7 (|x-5| - 4\sqrt{49-x^2})\,dx$ using the properties of definite integrals and interpreting in terms of area. **SCORE: _____ / 5 PTS**

NOTE: You must show the proper use of the properties of the definite integral, NOT just the arithmetic.

$$\underbrace{\int_0^7 |x-5|\,dx - 4\int_0^7 \sqrt{49-x^2}\,dx}_{2} = \underbrace{\tfrac{1}{2}\cdot 5\cdot 5}_{\frac{1}{2}} + \underbrace{\tfrac{1}{2}\cdot 2\cdot 2}_{\frac{1}{2}} \underbrace{- 4\cdot \tfrac{1}{4}\pi(7)^2}_{1\frac{1}{2}}$$

$$= \underbrace{\frac{29}{2} - 49\pi}_{\frac{1}{2}}$$





Using the limit definition of the definite integral, and right endpoints, find $\int_{-1}^{5} (4x^2 + 8x)\, dx$. **SCORE: _____ / 10 PTS**

NOTE: Solutions using any other method will earn 0 points.

$\Delta x = \frac{5--1}{n} = \frac{6}{n}$

1 $\lim_{n\to\infty} \sum_{i=1}^{n} f\left(-1+\frac{6i}{n}\right)\frac{6}{n}$ 1

$= \lim_{n\to\infty} \frac{6}{n} \sum_{i=1}^{n} \left[4\left(-1+\frac{6i}{n}\right)^2 + 8\left(-1+\frac{6i}{n}\right)\right]$ $1\frac{1}{2}$

$= \lim_{n\to\infty} \frac{6}{n} \sum_{i=1}^{n} \left[4\left(1-\frac{12i}{n}+\frac{36i^2}{n^2}\right) - 8 + \frac{48i}{n}\right]$

$= \lim_{n\to\infty} \frac{6}{n} \sum_{i=1}^{n} \left[4 - \cancel{\frac{48i}{n}} + \frac{144i^2}{n^2} - 8 + \cancel{\frac{48i}{n}}\right]$

$= \lim_{n\to\infty} \frac{6}{n} \sum_{i=1}^{n} \left[-4 + \frac{144i^2}{n^2}\right]$ 2

$= \lim_{n\to\infty} \frac{\cancel{6}}{\cancel{n}} \left[-4n + \frac{\overset{24}{\cancel{144}}}{n^2} \cdot \frac{n(n+1)(2n+1)}{\cancel{6}}\right]$

1 $\frac{1}{2}$ 1

$= \lim_{n\to\infty} 6\left[-4 + 24\left(1+\frac{1}{n}\right)\left(2+\frac{1}{n}\right)\right]$ 1

$= 6\left[-4 + 24\cdot 1\cdot 2\right]$

$= 6(44)$

$= 264$ 1 ONLY IF YOU USED THE $\lim_{n\to\infty}\sum_{i=1}^{n}$ DEFINITION + METHOD