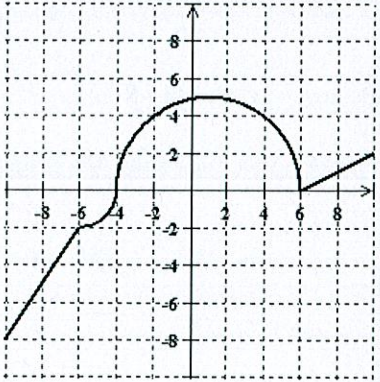
The graph of function f is shown on the right. **SCORE: _____ / 4 PTS**

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



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

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

$$\underbrace{\frac{1}{2}\pi(5)^2}_{\frac12}+\underbrace{\frac12 4\cdot 2}_{\frac12}-\underbrace{\frac{8+2}{2}\cdot 4}_{\frac12}-\underbrace{\frac14\pi(2)^2}_{\frac12}$$

$$=\frac{25}{2}\pi+4-5\cdot4-\pi$$

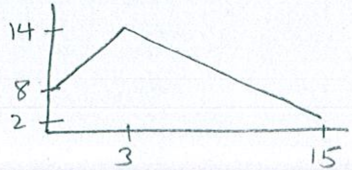
$$=\underbrace{\frac{23}{2}\pi-16}\ \frac12$$

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

$$-\int_{-10}^{6} f(x)dx=-\left[\frac{25}{2}\pi-5\cdot4-\pi\right]=\underbrace{-}_{1}\Big(\underbrace{\frac{23\pi}{2}-20\Big)}_{\frac12}=20-\frac{23\pi}{2}$$

A person's velocity (in meters per second) at time t (in seconds) is given by $v(t)=\begin{cases}2t+8, & 0\le t\le 3\\ 17-t, & 3\le t\le 15\end{cases}$. **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.



$\frac{1}{2}$ $\frac{8+14}{2}\cdot 3+\frac{14+2}{2}\cdot 12$ $\frac{1}{2}$

$=11\cdot 3+8\cdot 12$

$=33+96=129$ METERS

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

[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.

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

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

$=8\cdot 5+12\cdot 5+7\cdot 5$

$=(8+12+7)\cdot 5$ $1\frac{1}{2}$ $\frac{1}{2}$

$=27\cdot 5=135$ METERS

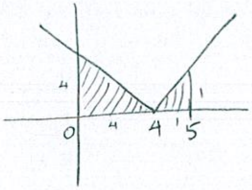
$\frac{1}{2}$ $\frac{1}{2}$

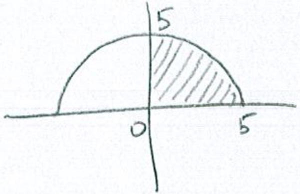
Evaluate $\int_0^5 (|x-4| - 8\sqrt{25-x^2})\,dx$ using the properties of definite integrals and interpreting in terms of area. **SCORE: _____ / 5 PTS**

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

$$\underbrace{\int_0^5 |x-4|\,dx - 8\int_0^5 \sqrt{25-x^2}\,dx}_{2} = \underbrace{\frac{1}{2}\cdot 4\cdot 4}_{\frac{1}{2}} + \underbrace{\frac{1}{2}\cdot 1\cdot 1}_{\frac{1}{2}} - \underbrace{8\cdot \frac{1}{4}\pi(5)^2}_{1\frac{1}{2}}$$

$$= \underbrace{\frac{17}{2} - 50\pi}_{\frac{1}{2}}$$





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

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

$\Delta x = \frac{1--2}{n} = \frac{3}{n}$

(1) $\underbrace{\lim_{n\to\infty}\sum_{i=1}^{n}}\, f\left(-2+\frac{3i}{n}\right)\underbrace{\frac{3}{n}}$ (1)

$= \lim_{n\to\infty}\frac{3}{n}\sum_{i=1}^{n}\underbrace{\left[2\left(-2+\frac{3i}{n}\right)^2+8\left(-2+\frac{3i}{n}\right)\right]}$ ($1\frac{1}{2}$)

$= \lim_{n\to\infty}\frac{3}{n}\sum_{i=1}^{n}\left[2\left(4-\frac{12i}{n}+\frac{9i^2}{n^2}\right)-16+\frac{24i}{n}\right]$

$= \lim_{n\to\infty}\frac{3}{n}\sum_{i=1}^{n}\left[8-\cancel{\frac{24i}{n}}+\frac{18i^2}{n^2}-16+\cancel{\frac{24i}{n}}\right]$

$= \lim_{n\to\infty}\frac{3}{n}\sum_{i=1}^{n}\underbrace{\left[-8+\frac{18i^2}{n^2}\right]}$ (2)

$= \lim_{n\to\infty}\frac{3}{\cancel{n}}\left[\underbrace{-8\cancel{n}}_{(1)}+\underbrace{\frac{\overset{3}{\cancel{18}}}{n^2}}_{(\frac{1}{2})}\underbrace{\frac{n(n+1)(2n+1)}{\cancel{6}}}\right]$ (1)

$= \underbrace{\lim_{n\to\infty}3\left[-8+3\left(1+\frac{1}{n}\right)\left(2+\frac{1}{n}\right)\right]}$ (1)

$= 3[-8+3\cdot1\cdot2]$

$= 3(-2)$

$= \underline{-6}$ (1) ONLY IF YOU USED THE $\lim_{n\to\infty}\sum_{i=1}^{n}$ DEFINITION + METHOD