Math 1B Quiz 1 Version 1
Mon Jan 23, 2017

NAME YOU ASKED TO BE CALLED IN CLASS: [redacted]

SCORE: 17 **/ 30 POINTS** 13 + 4 GREENSHEET QUIZ

1. NO CALCULATORS OR NOTES ALLOWED
2. UNLESS STATED OTHERWISE, YOU MUST SIMPLIFY ALL ANSWERS
3. SHOW PROPER CALCULUS LEVEL WORK TO JUSTIFY YOUR ANSWERS

A person's velocity (in meters per minute) at time t (in minutes) is given by $v(t) = \begin{cases} 20-2t, & 0 \le t \le 8 \\ t-4, & 8 \le t \le 18 \end{cases}$. **SCORE:** $3\frac{1}{2}$ **/ 5 PTS**

[a] Find the exact distance the person travelled from time $t = 0$ seconds to $t = 18$ seconds.
NOTE: You must show the arithmetic expression that you used to get your answer.

$\left(\frac{1}{2} \cdot 8 \cdot 4\right) + \left(\frac{14+4}{2}\ 10\right)$ 1

$16 + 90 = 106$

[b] Estimate the distance the person travelled from time $t = 0$ seconds to $t = 18$ seconds using three subintervals and left endpoints.
NOTE: You must show the arithmetic expression that you used to get your answer.

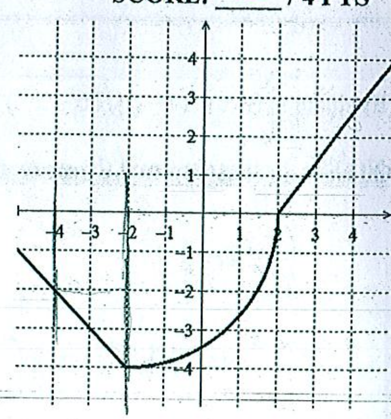
$\Delta x = \frac{18}{3} = 6$

$6\,(v(0) + v(6) + v(12))$

2 $6\,(20 + 8 + 8) = 6\,(36) = 216$ $\frac{1}{2}$

$36 \cdot 6 = 216$

The graph of function f is shown on the right. **SCORE:** $\frac{1}{2}$ **/ 4 PTS**
The graph consists of a diagonal line, an arc of a circle, then another diagonal line.



[a] Evaluate $\int_{-5}^{5} f(x)\,dx$.

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

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

$6 - \frac{2\ 16\pi}{8} - 6 - \frac{3}{2}$

$-2\pi - \frac{3}{2} = \boxed{\frac{-4\pi - 3}{2}}$

[b] Evaluate $\int_{5}^{-2} f(x)\,dx$.

$-\int_{-2}^{5} f(x)\,dx$

$-(-2\pi + 6) = 2\pi - 6$

Using the limit definition of the definite integral, and right endpoints, find $\int_{-3}^{-1}(3x^2+15x+18)\,dx$. SCORE: 5 / 10 PTS

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

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

1 $\lim\limits_{n\to\infty} \sum_{i=1}^{n} f\left(-3+i\cdot\frac{2}{n}\right)\frac{2}{n}$

$\lim\limits_{n\to\infty} \sum_{i=1}^{n} \left[\left(-3+\frac{2i}{n}\right)^2+15\left(-3+\frac{2i}{n}\right)+1\right]\frac{2}{n}$ 1

$\lim\limits_{n\to\infty} \sum_{i=1}^{n} \left[\left(-9-\frac{6i}{n}+\frac{4i^2}{n^2}-\frac{6i}{n}\right)-45+\frac{30i}{n}+1\right]\frac{2}{n}$

$\lim\limits_{n\to\infty} \sum_{i=1}^{n} \left[-9-\frac{12i}{n}+\frac{4i^2}{n^2}-44+\frac{30i}{n}\right]\frac{2}{n}$

$\lim\limits_{n\to\infty} \sum_{i=1}^{n} \left[-53+\frac{18i}{n}+\frac{4i^2}{n^2}\right]\frac{2}{n}$

$\lim\limits_{n\to\infty} \sum_{i=1}^{n} \left[-\frac{106}{n}+\frac{36i}{n^2}+\frac{8i^2}{n^3}\right]$

$\lim\limits_{n\to\infty} \left(-\frac{106}{n}\sum_{i=1}^{n}1+\frac{36}{n^2}\sum_{i=1}^{n}i+\frac{8}{n^3}\sum_{i=1}^{n}i^2\right)$

$\lim\limits_{n\to\infty} \left(-\frac{106}{\cancel{n}}\cancel{n}+\frac{36}{n^2}\left(\frac{n(n+1)}{2}\right)+\frac{8}{n^3}\left(\frac{n(n+1)(2n+1)}{6}\right)\right)$ 1 1

$\lim\limits_{n\to\infty} \left(-106+\frac{36}{2}\cdot\frac{n}{n}\cdot\frac{n+1}{n}+\frac{8}{6}\frac{n}{n}\cdot\frac{n+1}{n}\cdot\frac{2n+1}{n}\right)$

$\lim\limits_{n\to\infty} \left(-106+18\cdot1\cdot\left(1+\frac{1}{n}\right)+\frac{4}{3}\cdot1\cdot\left(1+\frac{1}{n}\right)\cdot\left(2+\frac{1}{n}\right)\right)$

1 $\lim\limits_{n\to\infty}$ ON EACH LINE WITH "n"

$-106+18\cdot(1+0)+\frac{4}{3}\cdot(1+0)\cdot(2+0)$

$-106+18+\frac{4}{3}\cdot 2$

$-106+18+\frac{8}{3}$

$-\frac{318}{3}+\frac{54}{3}+\frac{8}{3}$

$\frac{256}{3}$

Evaluate $\int_{-4}^{4}(|x-1|-5\sqrt{16-x^2})\,dx$ using the properties of definite integrals and interpreting in terms of area. SCORE: 4 / 5 PTS

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

$\int_{-4}^{4}|x-1|\,dx-\int_{-4}^{4}5\sqrt{16-x^2}\,dx$

$\int_{-4}^{4}|x-1|\,dx-5\int_{-4}^{4}\sqrt{16-x^2}\,dx$ 2

1 $\left(\frac{1}{2}\cdot5\cdot5+\frac{1}{2}\,3\cdot3\right)-5\left(\frac{1}{2}\cdot\frac{1}{2}\pi 4^2\right)$

$\cancel{\frac{34}{2}}$ 17 $-5(4\pi)$

$17-20\pi$