Math 455AB
Palekar/Wagner

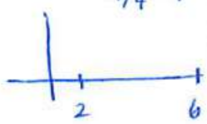
Trapezoidal Approximations

Name: Moi
Date: ____________

1) Approximate the definite interval of $f(x) = x^2 + 3x - 4$ from $x = 2$ to $x = 6$ using:

a) 4 equal subintervals

$4/4 = 1$



$$A = \tfrac{1}{2}(1)\left[f(2) + 2\overset{14}{f(3)} + 2\overset{24}{f(4)} + 2\overset{36}{f(5)} + \overset{50}{f(6)} \right]$$

$$= \tfrac{1}{2}\left[6 + 28 + 48 + 72 + 50 \right]$$

$$= \tfrac{1}{2}\left[204 \right]$$

$$\approx \boxed{102}$$

b) 8 equal subintervals

$\frac{4}{8} = \frac{1}{2}$

$$A = \tfrac{1}{2}\left(\tfrac{1}{2}\right)\Big[\overset{6}{f(2)} +$$
$$2\overset{9.75}{f(2.5)} +$$
$$2\overset{14}{f(3)} +$$
$$2\overset{18.75}{f(3.5)} +$$
$$2\overset{24}{f(4)} +$$
$$2\overset{29.75}{f(4.5)} +$$
$$2\overset{36}{f(5)} +$$
$$2\overset{42.75}{f(5.5)} +$$
$$\overset{50}{f(6)}$$

$$+$$

$$\tfrac{1}{4}(406) =$$

$$\boxed{101.5}$$

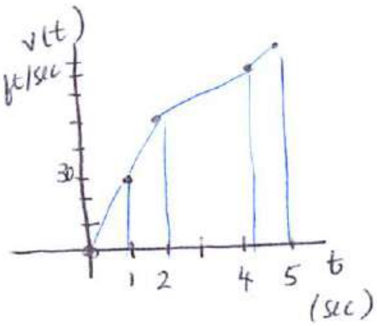
c) your Ti to find the exact value:

$$\frac{304}{3} = 101\tfrac{1}{3}$$

2) The table shows the velocity (in ft/sec) of a car at different times t (in seconds). Estimate the ***distance*** the car has traveled over the 5 seconds.

careful

t	0	1	2	4	5
$v(t)$	0	30	50	80	85



$$\text{Distance} \approx \tfrac{1}{2}(1)(\overset{30}{0+30}) \qquad 15$$

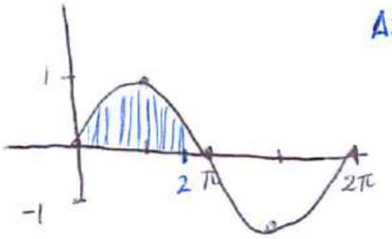
$$\tfrac{1}{2}(1)(\overset{80}{30+50}) \qquad 40$$

$$\tfrac{1}{2}(2)(\overset{130}{50+80}) \qquad 130$$

$$\tfrac{1}{2}(1)(\overset{165}{80+85}) \qquad 82.5$$

$$\boxed{267.5 \text{ ft/sec}}$$

3) Approximate the area under the curve $f(x)=\sin x$ from $x=0$ to $x=2$ using 5 equal subintervals. Round to the *nearest thousandths*. [include a sketch]



$\Delta x = \frac{2-0}{5} = \frac{2}{5}$

$A \approx \frac{1}{2}\left(\frac{2}{5}\right)\left[f(0) + 2f\left(\frac{2}{5}\right) + 2f\left(\frac{4}{5}\right) + 2f\left(\frac{6}{5}\right) + 2f\left(\frac{8}{5}\right) + f(2) \right]$

$\approx \boxed{1.397}$

4) The accompanying table shows time-to-time speed data for a 1994 Ford Mustang Cobra accelerating from rest to 130 mph. How far had the Mustang traveled, in **miles**, by the time it reached this speed? (Use trapezoids to estimate the area under the velocity curve, but be careful: the time intervals vary in length.)

Speed change		Time (sec)	
		0	
Zero to 30 mph	≈ 44 ft/sec	2.2	2.2
40 mph	≈ 176/3	3.2	1
50 mph	220/3	4.5	1.3
60 mph	88	5.9	1.4
70 mph	308/3	7.8	1.9
80 mph	352/3	10.2	2.4
90 mph	132	12.7	2.5
100 mph	440/3	16.0	3.3
110 mph	484/3	20.6	4.6
120 mph	176	26.2	5.6
130 mph	572/3	37.1	10.9

Source: Car and Driver, April 1994

$\frac{30\text{ mi}}{h} \cdot \frac{5280\text{ ft}}{1\text{ mile}} \cdot \frac{1\text{ hr}}{60\text{ min}} \cdot \frac{1\text{ min}}{60\text{ sec}} =$

44 ft/sec

$D \approx \frac{1}{2}(2.2)(0+44)$

$\frac{1}{2}(1)\left(44+\frac{176}{3}\right)$

$\frac{1}{2}(1.3)\left(\frac{176}{3}+\frac{220}{3}\right)$

$\frac{1}{2}(1.4)\left(\frac{220}{3}+88\right)$

$\frac{1}{2}(1.9)\left(88+\frac{308}{3}\right)$

$+\ \frac{1}{2}(2.4)\left(\frac{308}{3}+\frac{352}{3}\right)$

$\frac{1}{2}(2.5)\left(\frac{352}{3}+132\right)$

$\frac{1}{2}(3.3)\left(132+\frac{440}{3}\right)$

$\frac{1}{2}(4.6)\left(\frac{440}{3}+\frac{484}{3}\right)$

$\frac{1}{2}(5.6)\left(\frac{484}{3}+176\right)$

$+\ \frac{1}{2}(10.9)\left(176+\frac{572}{3}\right)$

5174 ft

$\approx \boxed{0.98 \text{ miles}}$