March 25

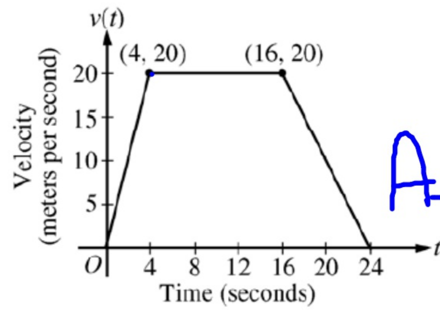
Mock Exam:
March 27th - 7:30 am
Room 5

How do you approximate the area under a curve using rectangles?

March 25

Students will verbally explain how to estimate the area under curve using trapezoids

(using the words:
interval, height, base...)



$$A_T = \frac{h(b_1+b_2)}{2}$$

5. A car is traveling on a straight road. For $0 \le t \le 24$ seconds, the car's velocity $v(t)$, in meters per second, is modeled by the piecewise-linear function defined by the graph above.

(a) Find $\int_0^{24} v(t)\,dt$. Using correct units, explain the meaning of $\int_0^{24} v(t)\,dt$.

(b) For each of $v'(4)$ and $v'(20)$, find the value or explain why it does not exist. Indicate units of measure.

(c) Let $a(t)$ be the car's acceleration at time t, in meters per second per second. For $0 < t < 24$, write a piecewise-defined function for $a(t)$.

(d) Find the average rate of change of v over the interval $8 \le t \le 20$. Does the Mean Value Theorem guarantee a value of c, for $8 < c < 20$, such that $v'(c)$ is equal to this average rate of change? Why or why not?

Distance x (cm)	0	1	5	6	8
Temperature $T(x)$ (°C)	100	93	70	62	55

3. A metal wire of length 8 centimeters (cm) is heated at one end. The table above gives selected values of the temperature $T(x)$, in degrees Celsius (°C), of the wire x cm from the heated end. The function T is decreasing and twice differentiable. → derivative at 7 = slope at 7 $\frac{55-62}{8-6} = \frac{-7}{2}\,\frac{°C}{cm}$

(a) Estimate $T'(7)$. Show the work that leads to your answer. Indicate units of measure.

(b) Write an integral expression in terms of $T(x)$ for the average temperature of the wire. Estimate the average temperature of the wire using a trapezoidal sum with the four subintervals indicated by the data in the table. Indicate units of measure.

Ave Temp $= \frac{605.5}{8} = 75.688$

$$\frac{\int_0^8 T(x)\,dx}{8-0} = \frac{1}{8}\int_0^8 T(x)\,dx$$

Int	~~x-value~~	b_1 y_1-value	b_2 y_2-value	h width	Area $= \frac{1}{2}h(b_1+b_2)$
$0 \to 1$		100	93	1	$= \frac{1}{2}(1)(100+93) = 96.5$
$1 \to 5$		93	70	4	$\frac{1}{2}(4)(93+70) = 326$
$5 \to 6$		70	62	1	$= \frac{1}{2}(1)(70+62) = 66$
$6 \to 8$		62	55	2	$= \frac{1}{2}(2)(62+55) = 117$

Total = 605.5

Approximate the area under the curve over the given interval using 4 trapezoids. of equal width

$$y = \frac{2}{x};\ [2, 4]$$

$$\text{width} = \frac{4-2}{4} = \frac{2}{4} = \frac{1}{2} = .5$$

$y = \frac{2}{x}$

Int.	Y_1	Y_2	width	Area
$2 \to 2.5$	$\frac{2}{2} = 1$	$\frac{2}{2.5} = .8$	.5	$\frac{1}{2}(.5)(1+.8) = .45$
$2.5 \to 3$	.8	$\frac{2}{3}$	.5	$\frac{1}{2}(.5)(.8+\frac{2}{3}) = .36666$
$3 \to 3.5$	$\frac{2}{3}$	$\frac{2}{3.5}$	.5	$\frac{1}{2}(.5)(\frac{2}{3}+\frac{2}{3.5}) = .31016$
$3.5 \to 4$	$\frac{2}{3.5}$	$\frac{2}{4}$	.5	$\frac{1}{2}(.5)(\frac{2}{3.5}+\frac{1}{2}) = .2685$

$A_T = 1.3936$

Approximate the area under the curve over the given interval using 4 trapezoids.

x	0	4	5	6	9
$f(x)$	6	7	5	6	8

x-val y-val

Int.	Y_1	Y_2	width	Area
$0 \to 4$	6	7	4	26
$4 \to 5$	7	5	1	6
$5 \to 6$	5	6	1	5.5
$6 \to 9$	6	8	3	21

Total = 58.5