Sing Along

"Differentiabul"

Infinitestimals dy over dx

Why he write it I can't say

Leibniz just liked it better that way

"Power Rule"

La la la la la la la la la la la la la

Power Rule

La la la la la la la la la la la la la

Power Rule

"Critical Point"

First time:

You know a saddle is a critical point,

That also is an inflection point

You know, you know a saddle is an inflection point that also is a critical point

Second time:

You know a saddle is a critical point,

That also is an inflection point.

You know, you know a saddle is an inflection ***point, that also is a critical; it's a critical; it's a*** *critical point.*

My Chapter Four Free Response Handout

[Ms. McCleary's Favorite AP Problem]

Sandy Point Beach

Sand pumping machine

Our clues:

INITIAL AMOUNT 2500 CUBIC yds

RATE REMOVAL $R(t)$

RATE ADDED $S(t)$ $\quad 0 \le t \le 6$

Set up your TI [Make sure you are in radians]

```
Plot1 Plot2 Plot3
\Y1=2+5sin((4πX)
/25)
\Y2=(15X)/(1+3X)

\Y3=
\Y4=
\Y5=
```

let $Y_3 = Y_2 - Y_1$
[Part C]

(a) What function should we use? $R(t)$

$$\int_0^6 R(t)\,dt \approx 31.816 \text{ yd}^3$$

or 31.815 yd^3

(b) We need a function to find the amount of sand at any time $0 \leq t \leq 6$

We have three things to consider:

I. Initial amount

II. Amount removed

III. Amount pumped onto the beach

$$y(t) = 2500 - \int_0^t R(x)\,dx + \int_0^t S(x)\,dx$$

INITIAL AMOUNT − Amt Removed + Amt PUMPED IN

(c) If $Y(t)$ is the amount of sand on the beach at any time, then what function will give us the RATE at which the amount of sand is changing?

need $y'(t)$

$$y'(t) = \frac{d}{dt}\left[2500 - \int_0^t R(x)\,dx + \int_0^t S(x)\,dx\right]$$

$$y'(t) = -R(t) + S(t)$$

$$y'(t) = S(t) - R(t)$$

$$y'(4) = S(4) - R(4)$$

$$y'(4) = -1.909\ \frac{yd^3}{hr}$$

use your BLEEPING TI

or $-1.908\ \frac{yd^3}{hr}$

(d) We are looking for the absolute minimum.
What t−values are our candidates?

endpoint CANDIDATES $t=0$, $t=6$
[USE YOUR TI TO LOCATE ANY RELATIVE MIN]

at $t \approx 5.117$ $y'(t)$ changes from negative to positive values Hence $y(t)$ has a rel min at $t \approx 5.117$ hr

CANDIDATE TESTING:

$y(0) = 2500$ yd^3

$$y(6) = 2500 - \int_0^6 R(x)\,dx + \int_0^6 S(x)\,dx$$

$y(6) \approx 2493.276$ yd^3

$$y(5.117) = 2500 - \int_0^{5.117} R(x)\,dx + \int_0^{5.117} S(x)\,dx$$

$y(5.117) \approx 2492.369$ yd^3

Hence the ab min occurs at $t \approx 5.117$ hr and the min value is 2492.369 yd^3

t	0	2	4	6	8	10	12
P(t)	0	46	53	57	60	62	63

(a) $\int_0^{12} P(t)\,dt \approx MRAM$

$MRAM = 4\left[P(2) + P(6) + P(10)\right]$

$= 660 \text{ ft}^3$

(b) $\int_0^{12} R(t)\,dt \approx 225.594 \text{ ft}^3$

(c) $1000 + \int_0^{12} P(t)\,dt - \int_0^{12} R(t)\,dt$

INITIAL AMT + AMT PUT IN − AMT LEAKED

$\approx 1434 \text{ ft}^3$

MUST BE ROUNDED TO NEAREST WHOLE NUMBER

(d) RATE AT WHICH VOLUME is CHANGING
Need $V'(t)$