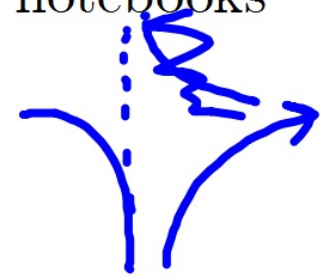
$$f'(x) = \frac{2x}{x^2-4}$$

Good afternoon: warm up in notebooks



1. Find f''(1) $f''(1)$

2. If f(0)=5, write the equation of tangent line at (0,5)

$y-5=0$ $y=5$ $y-5=m(x-0)$

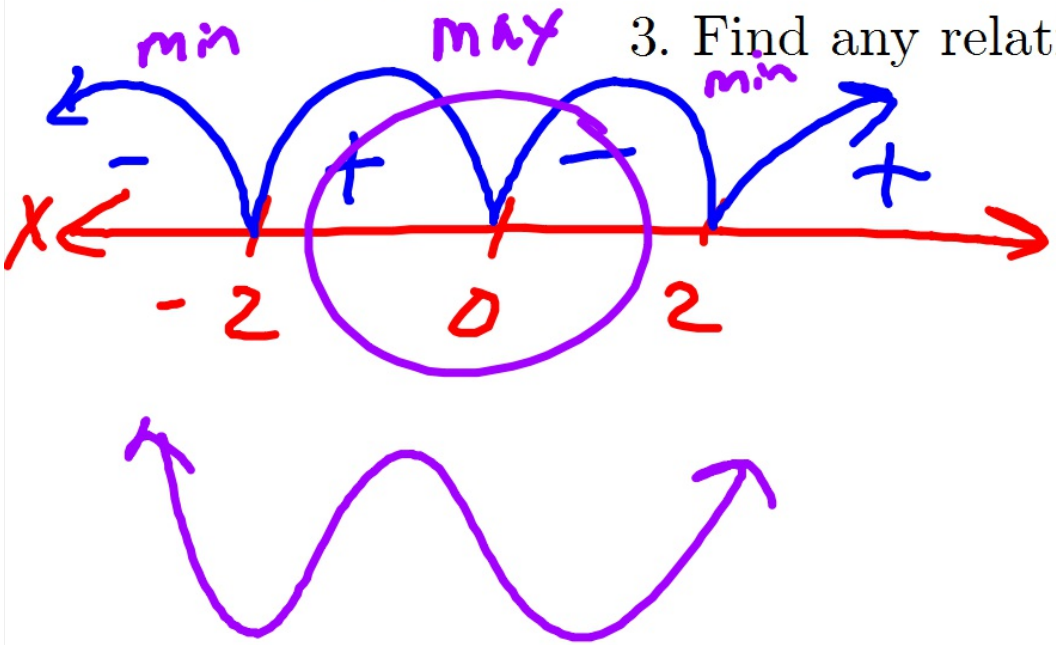
3. Find any relative maxima or minima of f

4. If f' measures velocity in m/s, find the distance traveled from 4s to 6s.

5. If f(0)=5, find f(3).

$$f'(x) = \frac{2x}{x^2-4}$$

3. Find any relative maxima or minima of f



C.N: $x=0$

$x=2,-2$

$$f'(x) = \frac{2x}{x^2-4}$$

4. If f' measures velocity in m/s, find the distance traveled from 4s to 6s.

$$\int_4^6 \frac{2x}{x^2-4}\,dx = \int_4^6 2x \cdot \frac{1}{x^2-4}\,dx$$

$$\left[\ln|x^2-4|\right]_4^6 \Rightarrow \ln|32| - \ln|12|$$

$$\ln 32/12$$

$$.981$$

MATH 9

5. If f(0)=5, find f(3)

$$f'(x) = \frac{2x}{x^2-4}$$

$$\int \frac{2x}{x^2-4}\,dx$$

$$\int 2x \cdot \frac{1}{x^2-4}\,dx \rightarrow \ln|x^2-4| + C \Rightarrow f(x) = \ln|x^2-4| + 3.614$$

$$f(x) = \ln|x^2-4| + c$$

$$f(3) = \ln 5 + 3.614$$

$$5.223$$

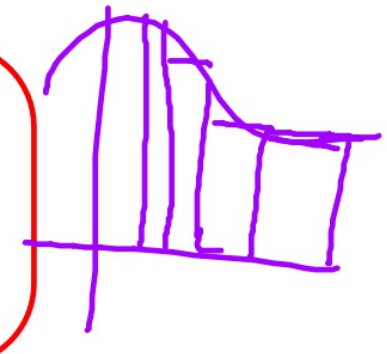
$$f(0) = \ln|-4| + C = 5$$

$$1.386 + C = 5 \rightarrow C = 3.614$$

Good afternoon again, warm up:

A moving object has its velocity recorded below.

t, sec	1	2	3	4
v(t), m/s	0.8	1.5	1.7	1.3



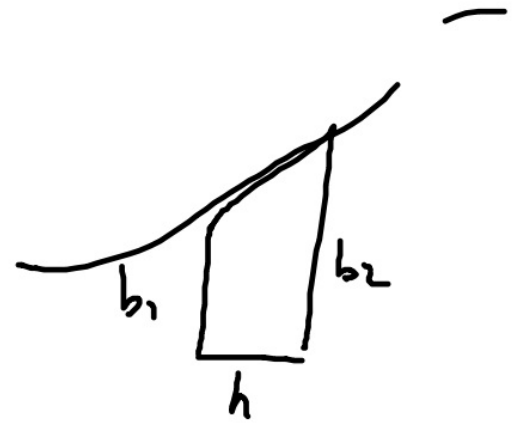
Approximate $\int_1^4 v(t)dt$ using the 3 trapezoids indicated by the table

$\Delta x = \frac{b-a}{n}$

Explain the meaning of the the integral and give units for your answer.

$\frac{\Delta x}{2}\left(f(x_1) + 2(\ldots) + f(x_n)\right)$

x	2	3	5	9
$f(x)$	0.1	0.8	1.3	2.7

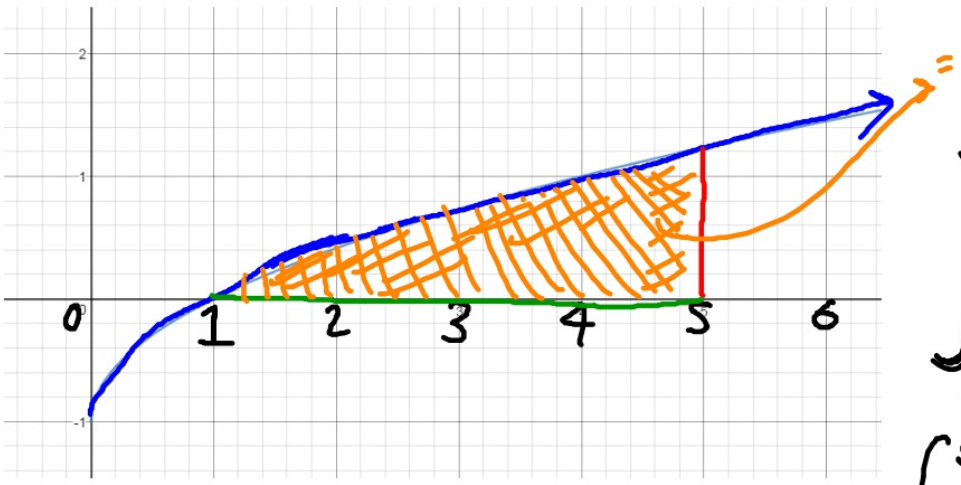


$$\int_2^9 f(x)\,dx \approx \frac{1}{2}(0.1+0.8)\cdot 1$$
$$+ \frac{1}{2}(.8+1.3)2$$
$$+ \frac{1}{2}(1.3+2.2)4$$

Area Under and Between Curves

Find the first quadrant area bounded by $y = -\frac{\sqrt{x} - x}{\sqrt{x}}$

the x-axis and x=5



$$= \int \square \quad \square \, dx$$

$$\int_1^5 -\frac{\sqrt{x} - x}{\sqrt{x}} \, dx$$

$$\frac{7-8}{5}$$

$$\frac{7}{5} - \frac{8}{5}$$

$$\int_1^5 -\frac{\sqrt{x}}{\sqrt{x}} + \frac{x^1}{\sqrt{x}} \, dx$$

FTC.

$$\int_1^5 -1 + x^{1/2} \, dx.$$

$$\left[-x + \frac{2}{3} x^{3/2} \right]_1^5$$

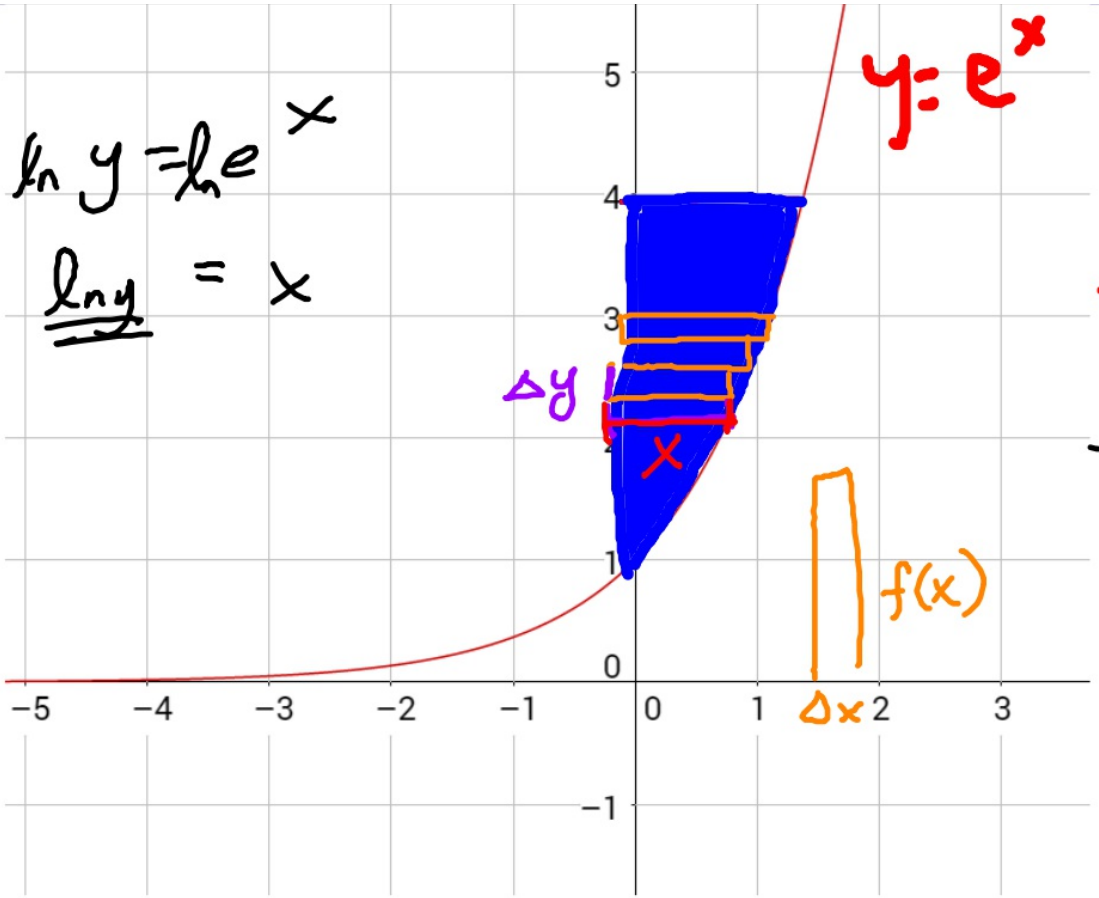
$$\frac{a^n}{a^m} = a^{n-m}$$

$$\left(-(5) + \frac{2}{3}(5)^{3/2} \right) - \left(-1 + \frac{2}{3}(1)^{3/2} \right) = 2.787$$

$$=$$

$\ln y = \ln e^{x}$

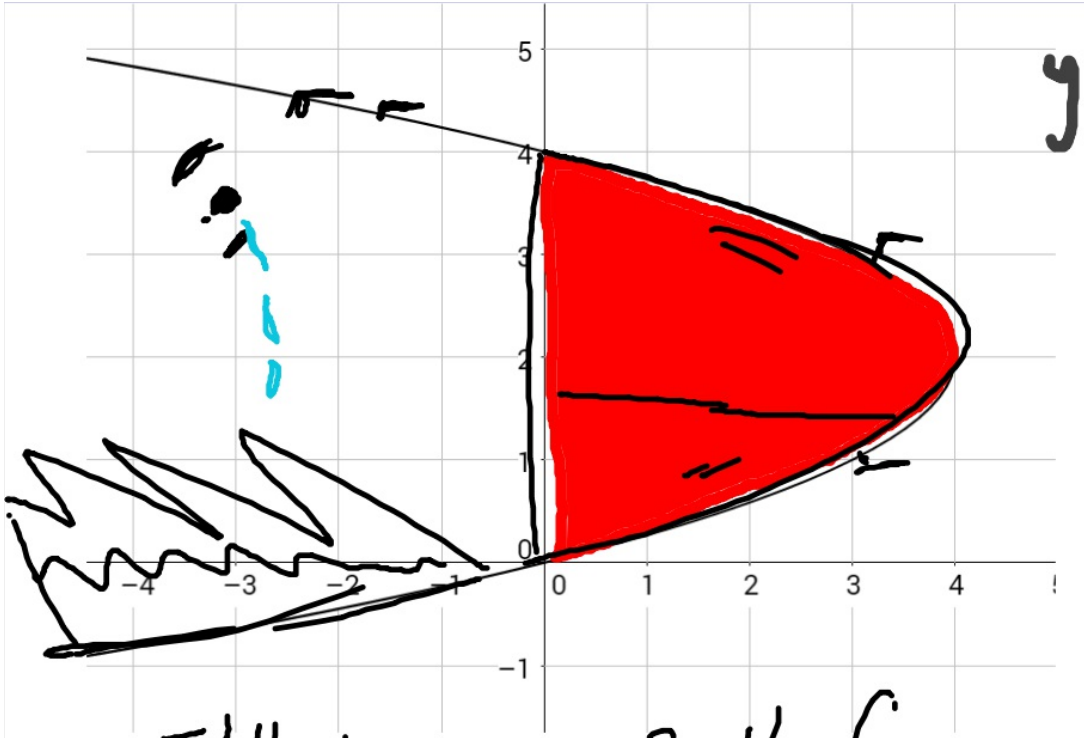
$\underline{\underline{\ln y}} = x$



$\int \cancel{x} \cdot \Delta y$

$\int_{1}^{4} \ln y \, dy \approx \boxed{2.545}$

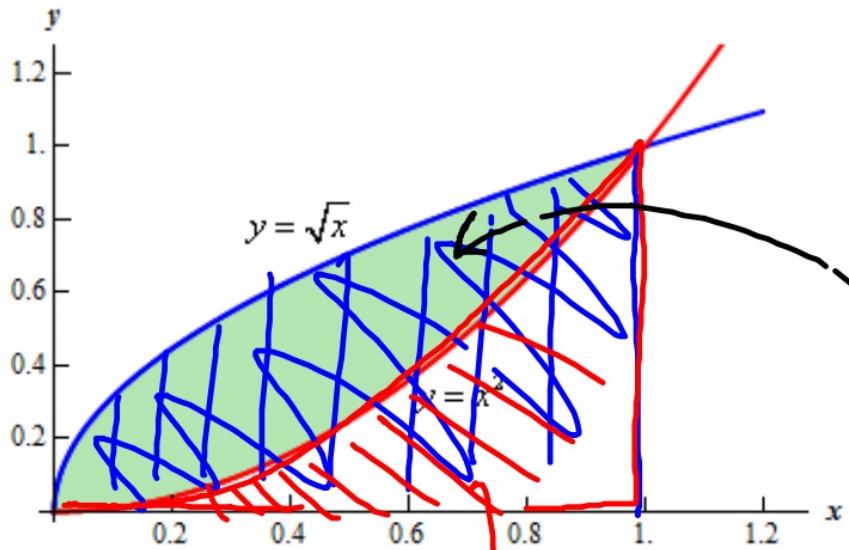
y-values (axis of summation)



$y = \sqrt{4 - x} + 2$

I'll never go South for winter again...

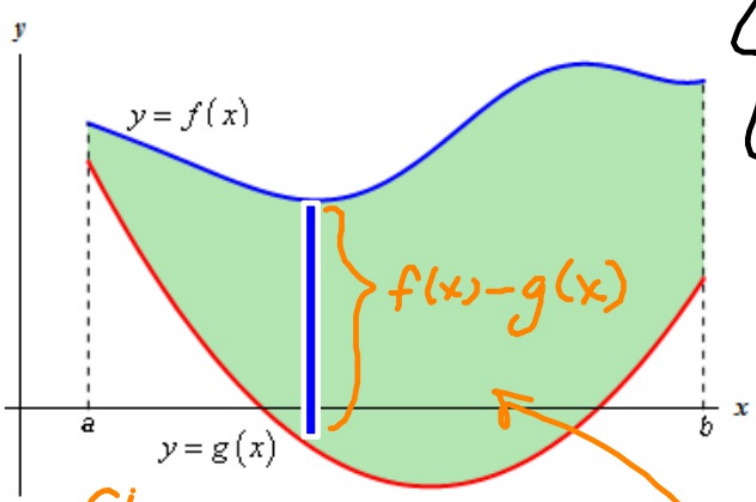
Area Between Curves

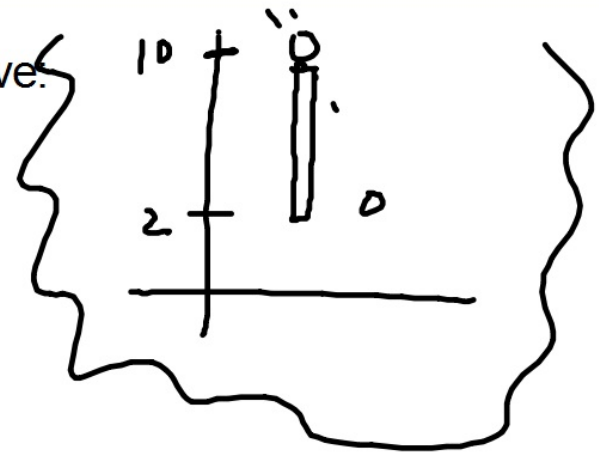


green area

$$\int_0^1 \sqrt{x}\,dx - \int_0^1 x^2\,dx = \int_0^1 \sqrt{x} - x^2\,dx = \frac{1}{3}$$

Even when some regions are negative:

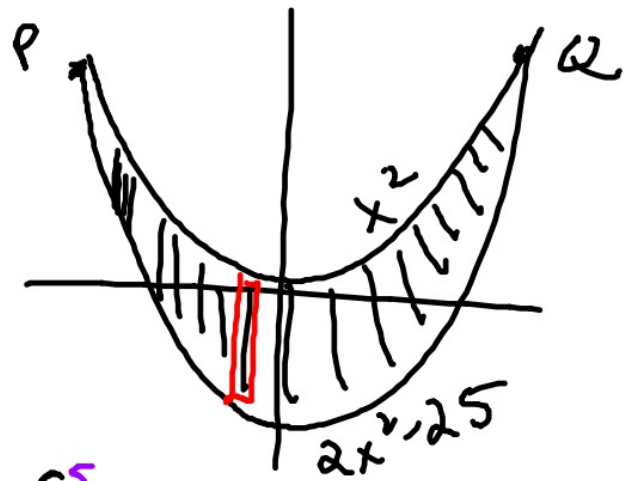




$$\int_a^b f(x)-g(x)\cdot dx =$$

$$\int (\text{Top function} - \text{bottom function})\,dx$$

2.)



$y = x^2$

$y = 2x^2 - 25$

$x^2 = 2x^2 - 25$

$0 = x^2 - 25$

$x = \pm 5$

$$\int_{-5}^{5} \underbrace{x^2 - 2x^2 + 25}\, dx$$

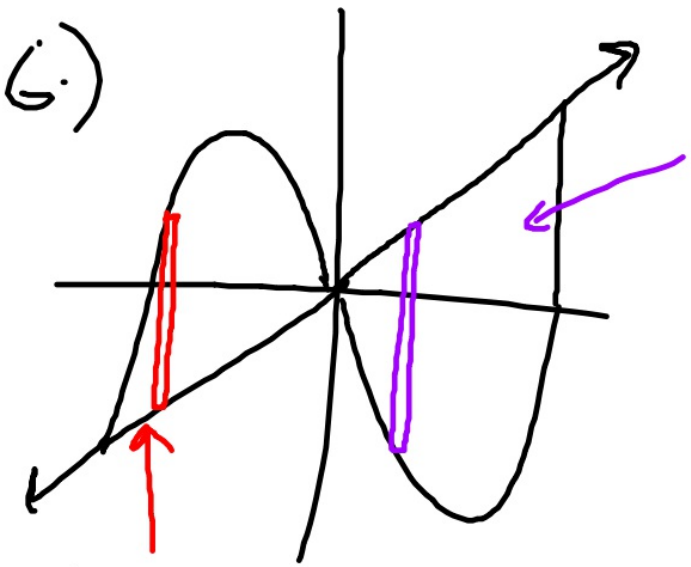
using symmetry

$$2 \cdot \int_0^5 25 - x^2 \, dx \rightarrow 2\left[25x - \frac{1}{3}x^3\right]_0^5 \rightarrow 2\left[\frac{250}{3}\right] = \frac{500}{3}$$

$\boxed{166.667}$

Let's practice!

6.)



$$\int_0^4 7x - x(x-3)(x+3)\,dx$$

$$\int_{-4}^0 x(x-3)(x+3) - 7x\,dx$$

HW: handout #1-10