Today's Plan:

Learning Target (standard): I will find the area of a region. I will use the area of the region to describe other quantities.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make necessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuracy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Assignment:

Find the area of each region bounded by the given functions:

1) $y = x^2 - 4$, $y = 0$, $x = 0$, $x = 4$

A = $16u^2$

2) $y^2 = x$, $x + y = 2$

A = $^9/_2u^2$

3) $y = x^2 - x - 2$, $x = 0, y = 0, x = 3$

A = $^{31}/_6u^2$

4) $y = x^2 - 3x$, $y = x$

A = $^{32}/_3u^2$

5) $x = y^2$, $y = x - 2$

A = $^9/_2u^2$

6) $y = \sin x$, $y = 0$, $x = 0$, $x = 4\pi$

A = $8u^2$

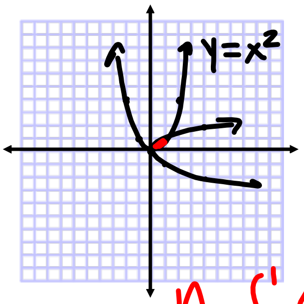
7) $x = 4 - y^2$, $x + y - 2 = 0$

A = $^9/_2u^2$

8) $y^2 - 2x = 0$, $y^2 + 4x - 12 = 0$

A = $8u^2$

Find the area of the region bounded by:



$y = x^2$

$x = y^2$

$y = \sqrt{x}$

$(\sqrt{x})^2 = (x^2)^2$

$x = x^4$

$0 = x^4 - x$

$0 = x(x^3 - 1)$

$x = 0, 1$

$A = \int_0^1 (\sqrt{x} - x^2)\,dx$

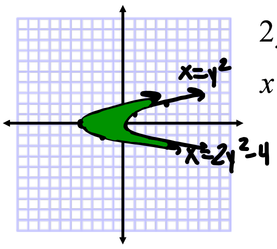
$= \int_0^1 (x^{\frac{1}{2}} - x^2)\,dx$

$= \left(\frac{2}{3}x^{\frac{3}{2}} - \frac{1}{3}x^3\right)\Big|_0^1$

$= \frac{2}{3} - \frac{1}{3}$

$A = \frac{1}{3}\,u^2$

Find the area of the region bounded by:



$2y^2 = x + 4$

$x = y^2$

$x = 2y^2 - 4$

vertex: $(-4, 0)$

$y = -\frac{b}{2a} = 0$

x	y
-2	-1
-4	0
-2	1

$2y^2 - 4 = y^2$

$y^2 - 4 = 0$

$(y+2)(y-2) = 0$

$y = -2, 2$

$A = \int_{-2}^{2} [y^2 - (2y^2 - 4)]\,dy$

$= \int_{-2}^{2} (-y^2 + 4)\,dy$

$= \left(-\frac{1}{3}y^3 + 4y\right)\Big|_{-2}^{2}$

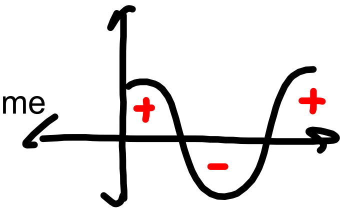
$= \left(-\frac{8}{3} + 8\right) - \left(\frac{8}{3} - 8\right)$

$= 16 - \frac{16}{3}$

$A = \frac{32}{3}\,u^2$

A particle moves along a line so that its velocity at time t is $v(t)=t^2-t-6$ (measured in meters per second).

a) Find the displacement of the particle during the time period $1 \leq t \leq 4$.



$$s(t)=\int v(t)dt$$

* straight integration *

$$\int_1^4 (t^2-t-6)\,dt$$

"net area"
- negative area offsets the positive area

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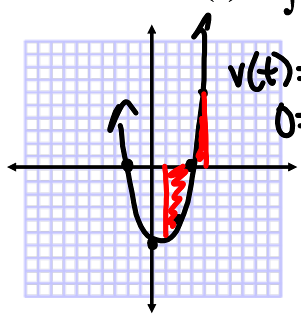


$v(t)=t^2-t-6$

$0=(t-3)(t+2)$

$t=3,-2$

$$\int_1^4 (t^2-t-6)\,dt$$

$$=\left(\tfrac{1}{3}t^3-\tfrac{1}{2}t^2-6t\right)\Big|_1^4$$

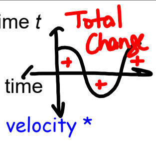
$$=\left[\tfrac{1}{3}(4)^3-\tfrac{1}{2}(4)^2-6(4)\right]-\left[\tfrac{1}{3}(1)^3-\tfrac{1}{2}(1)^2-6(1)\right]$$

$$=\tfrac{64}{3}-8-24-\tfrac{1}{3}+\tfrac{1}{2}+6$$

$$=\tfrac{62}{3}-26+\tfrac{1}{2}$$

displacement $=-\tfrac{9}{2}$ m

A particle moves along a line so that its velocity at time *t* is $v(t)=t^2-t-6$ (measured in meters per second).



b) Find the distance traveled during the same time period.

* distance accounts for direction of velocity *

$v(t)>0$ right

$v(t)<0$ left

$v(t)=0$ and $a(t)\neq 0$

- change direction

$v(t)=t^2-t-6$

$0=(t-3)(t+2)$

$1\le t\le 4$ $t=-2,3$

Domain Interval	$t-3$	$t+2$	$v(t)$	Direction
$(1,3)$	$-$	$+$	$-$	left
$(3,4)$	$+$	$+$	$+$	right

> change of direction

$$\text{distance} = -\int_1^3 v(t)\,dt + \int_3^4 v(t)\,dt$$

left $-(-)$ $v(t)>0$

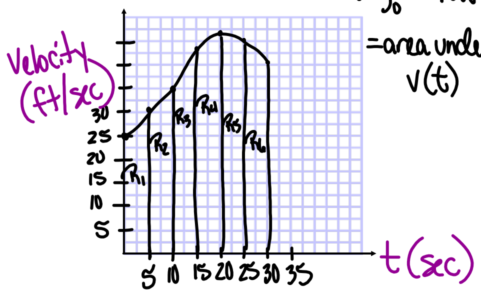
right $v(t)>0$

Suppose the odometer on your car is broken and you want to estimate the distance driven over a 30-second time interval. You took speedometer readings every five seconds and recorded them in the table. Use these recordings to estimate your distance.

Time(sec)	0	5	10	15	20	25	30
Velocity(*ft* / sec)	25	31	35	43	47	46	41

$d=\int_0^{30} v(t)\,dt$

= area under $v(t)$



$A_{trap}=\frac{1}{2}(b_1+b_2)\cdot h$

units $= x\cdot y$

$=$ seconds $\cdot \frac{ft}{seconds}$

$=$ feet

$A_{R_1}=\frac{1}{2}(35+31)\cdot 5$

$=\frac{5}{2}(56)$

$A_{R_1}=140$ ft

$A_{R_2}=\frac{1}{2}(31+35)\cdot 5$

$=\frac{5}{2}(66)$

$A_{R_2}=165$ ft

*continue for the other regions

Assignment:

Area of Regions Worksheet

#1-8