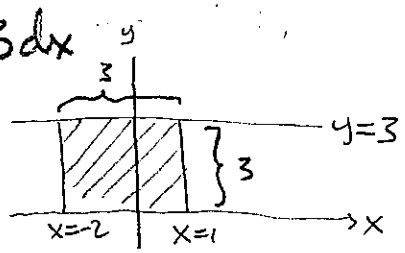
Worksheet For 11/14/13

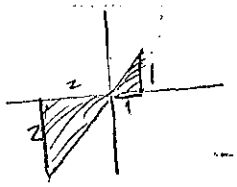
Compute (using areas):

① $\int_{-2}^{1} 3\,dx$



9

② $\int_{-2}^{1} x\,dx$

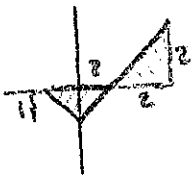


$\frac{1}{2}\cdot 1\cdot 1 - \frac{1}{2}\cdot 2\cdot 2$

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

-3/2

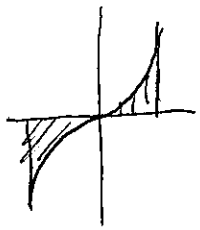
③ $\int_{-1}^{3} (|x|-1)\,dx$



$2 - 1 =$

1

④ $\int_{-\pi}^{\pi} x^3\,dx$



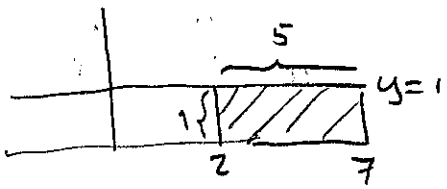
symmetric around origin

$\Rightarrow$ positive & negative areas cancel.

0

⑤ $\int_{7}^{2} dx = -\int_{2}^{7} 1\cdot d = -1.5.$

-5



Part 2

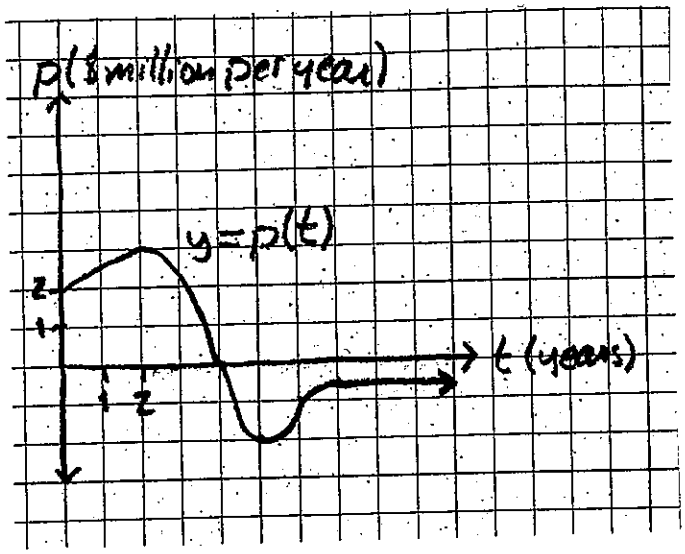
(6) Find $\frac{d}{dx}\int_1^x \left(\frac{1}{t}\right)dt$ $\boxed{1/x}$ (Fund. theorem)

(7) Find $\frac{d}{dx}\int_{12}^x \sqrt{s^2+17}\,ds$ $\boxed{\sqrt{x^2+17}}$ (Fund. theorem.)

(8) Find $\frac{d}{dx}\int_7^{x^2} \sin t\,dt$ $F(x)=\int_7^x \sin t\,dt$, $F'(x)=\sin x$ | we want $\frac{d}{dx}F(x^2)$, which is $F'(x^2)\cdot 2x$ $= \boxed{\sin(x^2)\cdot 2x}$

(9) Find $\frac{d}{dx}\int_x^{100} e^t dt$ $= -\frac{d}{dx}\int_{100}^x e^t dt = \boxed{-e^x}$

(10)



Let $p(t)$ be the profit (in millions of dollars per year) that a company is bringing in, where t is in years. The graph is shown at right.

Let $P(t)$ be the net profit from time 0 to time t.

$P(t)=\int_0^t p(s)\,ds$.

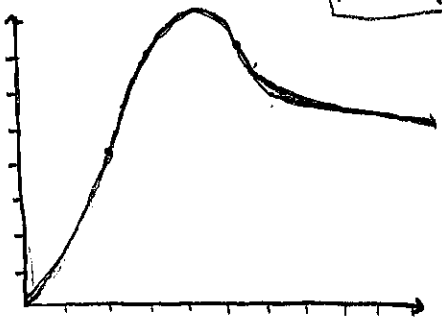
a) What is $P(0)$? $\boxed{0}$ (nothing accumulated yet).

b) When is $P(t)$ largest? $\boxed{t=4}$ ($P'(t)>0$ before; $P'(t)<0$ after).

c) Where is $P(t)$ concave up/down?

up: $[0,2]$ & $(5,4)$ ($p(t)$ increasing)
down $(2,5)$ ($p(t)$ decreasing)

d) Sketch $P(t)$.



(rough sketch)