MA 121 – 003

Monday, November 12

- interview quiz returned
- Q2 handed out; due WED 11/14 – beg. of class
- finish 4.5: (integration using SUBST)
- begin CH 5: 5.1: consumer surplus; producer surplus
- return TEST #3:

$$\int x \cdot \sqrt[5]{1-x^2}\, dx$$

$$\left(-\frac{1}{2}\right)\int (1-x^2)^{1/5} \cdot x \cdot dx \,(-2)$$

let $u = 1-x^2$

$$\frac{du}{dx} = -2x \cdot dx$$

$$du = -2x \cdot dx \quad \checkmark$$

$$-\frac{1}{2}\int u^{1/5} \cdot du$$

$$-\frac{1}{2}\left[\frac{u^{6/5}}{6/5}\right] + C$$

$$-\frac{1}{2}\cdot\frac{5}{6}\left[1-x^2\right]^{6/5} + C$$

$$= \frac{-5}{12}\left(1-x^2\right)^{6/5} + C$$

4.5: INTEGRATION USING SUBST.

$$\frac{1}{12}\int (3t^4+2)^5 \cdot t^3 \cdot dt \cdot 12 \qquad t; dt$$

let $u = 3t^4+2$

$\frac{du}{dt} = 12t^3 \cdot dt$

$du = 12t^3 \cdot dt$

$$\frac{1}{12}\int u^5 \cdot du \qquad u; du$$

$$\frac{1}{12}\cdot\frac{u^6}{6} + C$$

$$\frac{1}{72}(3t^4+2)^6 + C$$

check: $d\left(\frac{1}{72}(3t^4+2)^6 + C\right) \stackrel{??}{=}$

$(3t^4+2)^5 \cdot t^3$

DEF. INTEGRAL

$$\int_{x=1}^{x=4} \frac{2x+1}{x^2+x+1}\,dx$$

$x=1 \xrightarrow{u=x^2+x+1} u=3$

$x=4 \longrightarrow u=21$

Let $u = x^2+x+1$

$\frac{du}{dx} = (2x+1)\cdot dx$ $\qquad du = (2x+1)dx$

$$\int_3^{21} \frac{du}{u} = \int_3^{21} \frac{1}{u}\,du$$

$$= \ln|u| \Big]_3^{21}$$

$$= \ln|21| - \ln|3| = \ln\frac{21}{3} = \ln 7$$

OR

$$\int_3^{21} \frac{du}{u} = \int_3^{21} \frac{1}{u}\,du$$

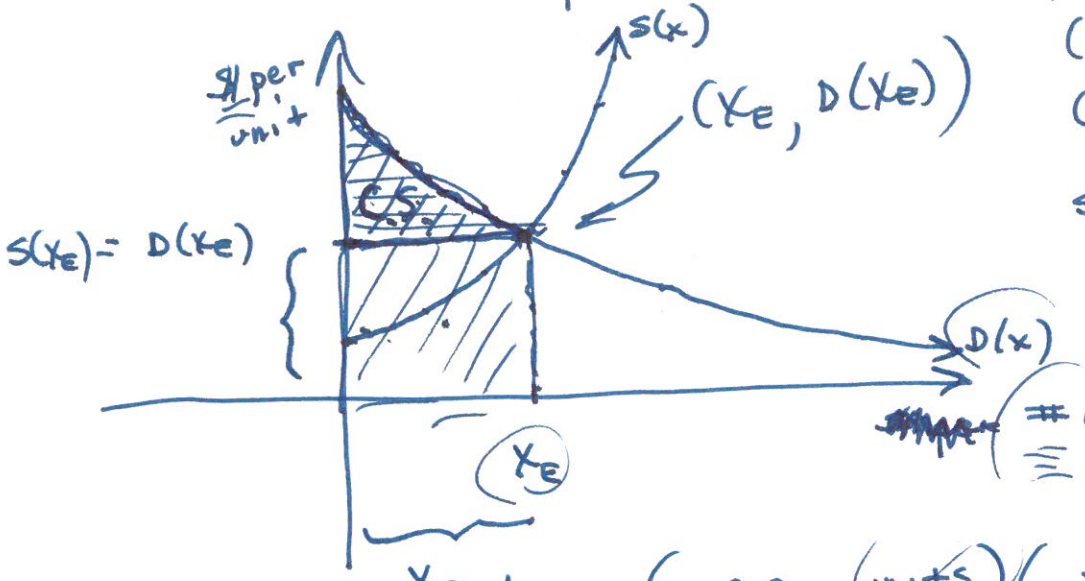
$$\ln|u| \Big]_3^{21} = \ln|x^2+x+1| \Big]_1^4$$

$$= \ln|4^2+4+1| - \ln|1^2+1+1|$$

$$= \ln|21| - \ln(3) = \ln\frac{21}{3}$$

$$= \ln 7$$

5.1: consumer surplus & producer surplus



(DEMAND CURVE)
(SUPPLY CURVE)

$S(x) = D(x)$
EQUIL. PT.

$x_e A = (\sim\ \text{units})(\sim\ \frac{\$}{\text{unit}})$

$A = \$(\sim)$

money box =

ex: $(14 \text{ items})(3^{00}/\text{item})$

$= \$42^{00}$

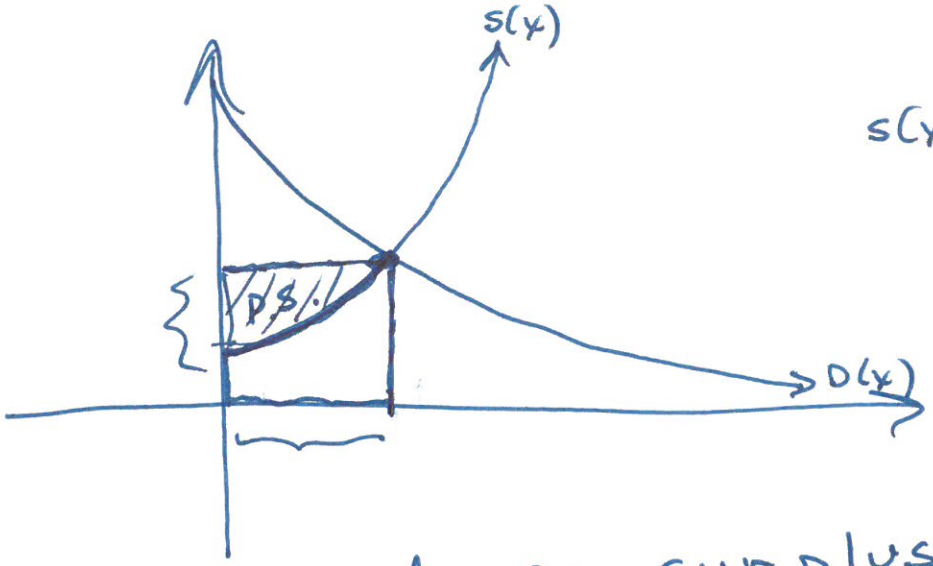
C.S. → not real money.

$$\text{C.S.} = \int_0^{x_e} D(x)\,dx - \text{money box}$$

what is it?

C.S. = $2.^{61}$

Good feeling or sense that you "got more than you paid for" (not $)



$S(x) = D(x)$

p.s = real #

Producer surplus:

$$P.S. = (\text{money box}) - \int_0^{x_E} S(x)\,dx$$

producer surplus - real # - part of the revenue (maybe the profit) for the seller.

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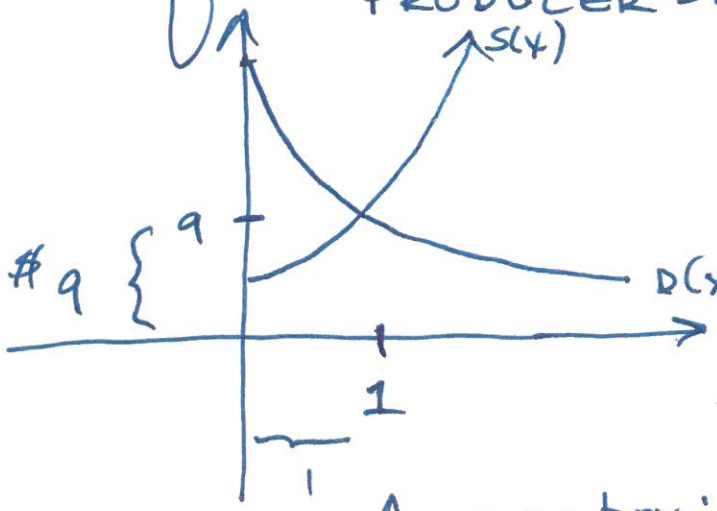
ex: $D(x) = (x-4)^2$ $S(x) = x^2 + 2x + 6$

find EQ. PT; CONSUMER SURPLUS; PRODUCER SURPLUS



EQ. PT:

$D(x) = S(x)$

$(x-4)^2 = x^2 + 2x + 6$

$x^2 - 8x + 16 = x^2 + 2x + 6$

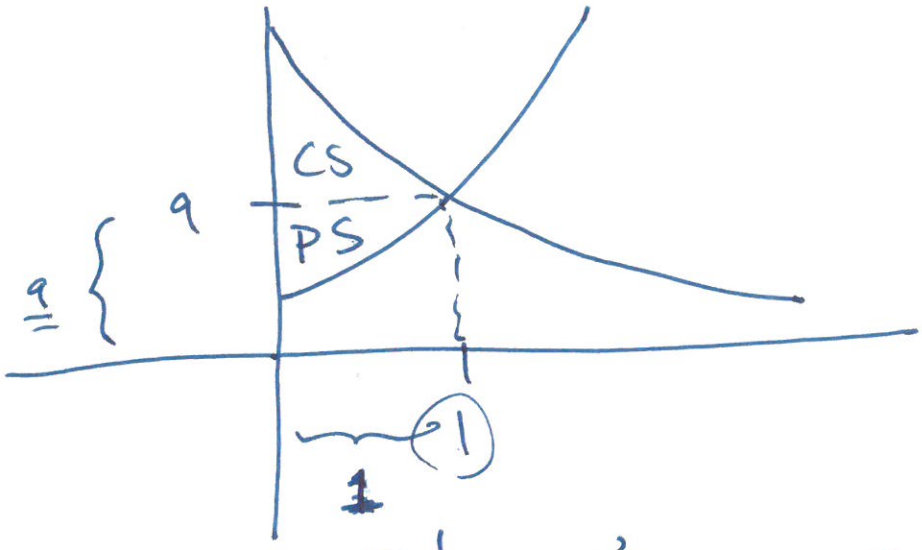
$+8x - 4 \qquad +8x - 4$

$10 = 10x$

$1 = x$

A money box:

$(1)(9) = 9$



$$C.S. = \int_0^1 (x-4)^2\,dx - (1)(9)$$

$$= \int_0^1 (x^2 - 8x + 16)\,dx - 9$$

$$= \left[\frac{x^3}{3} - \frac{8x^2}{2} + 16x\right]_0^1 - 9$$

$$= \left(\frac{1}{3} - 4 + 16\right) - 9 = 3\tfrac{1}{3} \approx 3.\overline{33}$$

$$P.S. = (1)(9) - \int_0^1 (x^2 + 2x + 6)\,dx$$

$$= 9 - \left[\frac{x^3}{3} + \frac{2x^2}{2} + 6x\right]_0^1$$

$$= 9 - \left[\left(\frac{1}{3} + 1 + 6\right) - (0)\right]$$

$$= 9 - 7\tfrac{1}{3} = 1\tfrac{2}{3} \left(\approx 1.\overline{67}\right)$$

Name_____ Row___Seat____

NORTH CAROLINA STATE UNIVERSITY Department of Mathematics

MA121-003 Quiz #2 Due Wednesday, November 14 (at the beginning of class) J. Griggs

Three points per question (1 point for following directions); you are to work **individually** on this quiz; it is permissible to use your book and/or notes from the class. Show **all** work and any graphs/diagrams on **this** sheet. (use the back, if necessary; no additional pages, please)

1.) Find the area bounded by the two curves: $f(x)=x^2-x-5$ *and* $g(x)=x+10$.

2.) Find the average value of the function $f(x)=x^2-x+1$ *on* $[0,2]$.

3.) Integrate using substitution: $\int (2t^5-3)^2\, t^4\, dt$

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TEST #3 RESULTS:

A's:	82	(40.4%)	60.6%
B's:	41	(20.2%)	
C's:	51	(25.1%)	
D's:	16	(7.9%)	14.3%
F's:	13	(6.4%)	

AVE: 82.6