

Tuesday, November 13

- return TEST #3
- hand out QUIZ #2 (due Thurs, 11/15)
- finish 4.5 (integration using subst.)
- begin 5.1: (consumer surplus; producer surplus)

ex:

$$\int \frac{(\ln x)^3}{x} dx$$

$$= \int (\ln x)^3 \cdot \left(\frac{1}{x} \cdot dx \right)$$

let $u = \ln x$

$du = \left(\frac{1}{x} \cdot dx \right)$

$$\int u^3 \cdot du = \frac{u^4}{4} + C$$

$$= \frac{(\ln x)^4}{4} + C$$

check: $d\left(\frac{1}{4}(\ln x)^4 + C\right) \stackrel{??}{=} \frac{(\ln x)^3}{x}$

from previous class

$x=4$

$x=1$

$\frac{2x+1}{x^2+x+1} dx$

4.5:

$y = \frac{2x+1}{x^2+x+1}$

$x=1 \rightarrow 3$
 $x=4 \rightarrow 21$

$A = \int du$

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

$du = (2x+1) dx$

$x=1 \rightarrow$

$u=3$

$x=4 \rightarrow$

$u=21$

$u = x^2 + x + 1$

$\int_3^{21} \frac{du}{u} = \ln|u| \Big|_3^{21}$
 $= \ln|x^2+x+1| \Big|_1^4$

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

$= \ln 21 - \ln 3 = \ln 7$

$\ln\left(\frac{a}{b}\right) = \ln a - \ln b$

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

$$\int \frac{e^{-\sqrt{x}}}{\sqrt{x}} dx = 2 \int e^{-\sqrt{x}} \cdot \frac{1}{\sqrt{x}} \cdot dx \cdot \frac{1}{2}$$

$$\text{let } u = \sqrt{x} = x^{\frac{1}{2}}$$

$$du = \frac{1}{2} x^{-\frac{1}{2}} \cdot dx$$

$$du = \frac{1}{2} \cdot \frac{1}{\sqrt{x}} \cdot dx$$

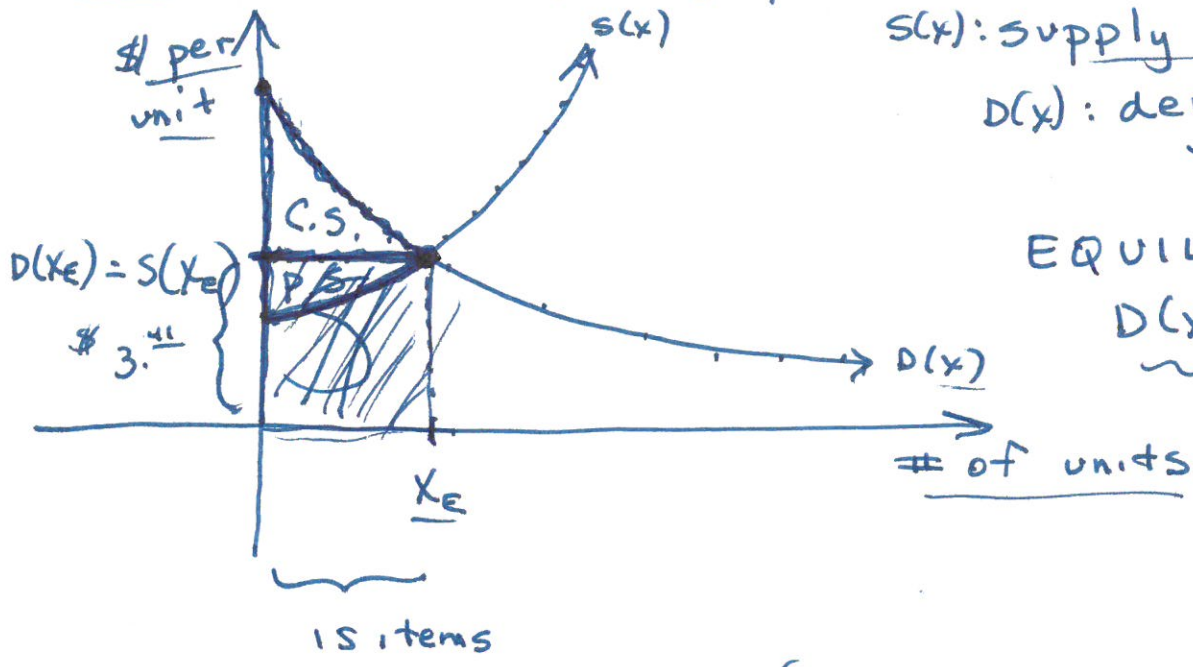
$$= 2 \int e^u \cdot du$$

$$= 2 \cdot e^u + C = 2 \cdot e^{-\sqrt{x}} + C$$

$$\text{check: } d(2 \cdot e^{-\sqrt{x}} + C) \stackrel{?}{=} \frac{e^{-\sqrt{x}}}{\sqrt{x}}$$

5.1: APPLICATIONS OF INTEGRAL.

Consumer surplus; producer surplus



$S(x)$: supply curve
 $D(x)$: demand curve

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

$$(15 \text{ items}) \left(3.41 \frac{\$}{\text{item}} \right) = \$ (15)(3.41)$$

Consumer surplus (C.S.)

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

DEF: a feeling or sense that we "got more than we paid for"

producer surplus (P.S.)

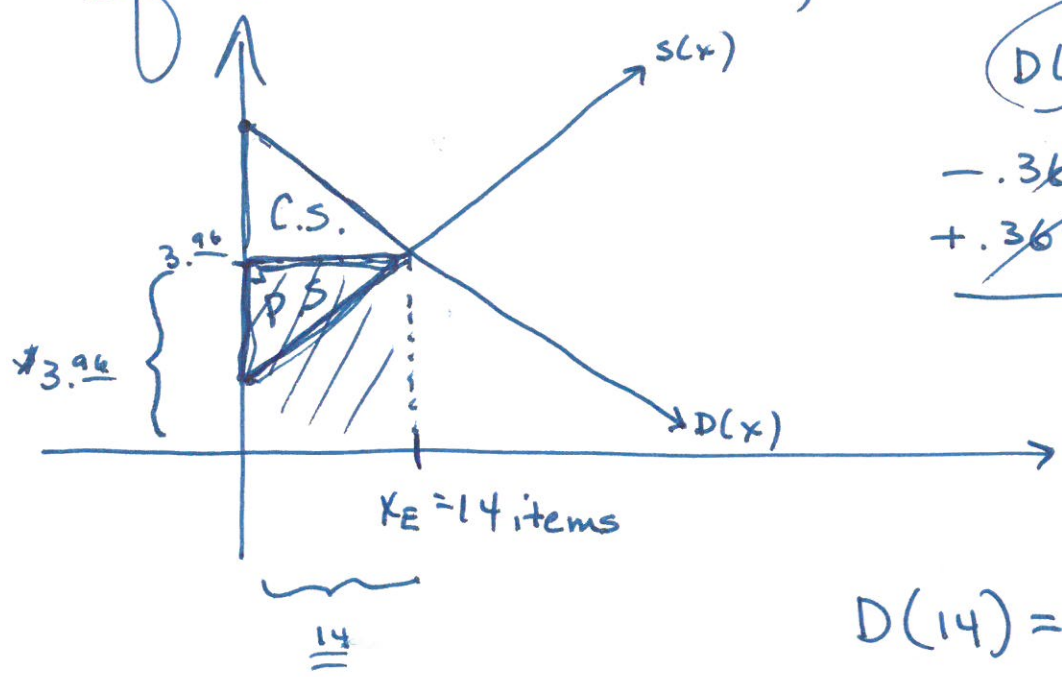
$$\text{P.S.} = (\text{money box}) - \int_0^{x_E} S(x) dx$$

DEF: real \$: part of the REV to the supplier (or possibly part of the PROFIT for the supplier)

$$D(x) = -.36x + 9$$

$$S(x) = .14x + 2$$

find the EQ. PT, C.S. and P.S.



$$D(x) = S(x)$$

$$-.36x + 9 = .14x + 2$$

$$+.36x - 2 + .36x - 2$$

$$\frac{7}{.5} = \frac{.8(x)}{.8}$$

$$x = 14$$

$$D(14) = -.36(14) + 9$$

$$D(14) = \underline{\$3.96}$$

money box: $(14) (\$3.96)$
 $= \underline{\underline{\$55.44}}$

$$C.S. = \int_0^{14} (-.36x + 9) dx - \underline{\underline{\$55.44}}$$

$$C.S. = \left[-.36 \frac{x^2}{2} + 9x \right]_0^{14} - \underline{\underline{\$55.44}}$$

$$C.S. = \left[\frac{-.36}{2} (14)^2 + 9(14) \right] - \underline{\underline{\$55.44}}$$

$$C.S. = \underline{\underline{\$35.28}}$$

(5)

$$P.S. = \left(\$55.\underline{44} \right) - \int_0^{14} \overbrace{(.14x + 2)}^{s(x)} dx$$

$$P.S. = \$55.\underline{44} - \left[.14 \frac{x^2}{2} + 2x \right]_0^{14}$$

$$= \$55.\underline{44} - \left[\frac{.14}{2} (14)^2 + 2(14) \right]$$

$$P.S. = \underline{\underline{\$13.\underline{72}}}$$

MA 121-001

TEST #3 RESULTS

A's	<u>78</u> (40.8%)	}	<u>66.5%</u>
B's	<u>49</u> (25.7%)		
C's	<u>31</u> (16.2%)		
D's	<u>14</u> (7.3%)	}	<u>17.2%</u>
F's	<u>19</u> (9.9%)		

AVE: 82.251

Name _____ Row ____ Seat ____

NORTH CAROLINA STATE UNIVERSITY

Department of Mathematics

MA121-001 Quiz #2 Due Thursday, November 15 (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: $\int (2t^5 - 3)^2 t^4 dt$

121-001 & 121-002:

TUES

(11/13) S.1

(11/20) S.3
S.6

(11/27) S.7
TEST 4 REV

(12/4) 6.1
6.2

THURS

(11/15) S.2
S.3

Thanksgiving
Break

(11/29) TEST #4

(12/6) 6.3:
final exam
review

12/10 $\xrightarrow{\text{final exams}}$ 12/18