EE320 Placement test

1. Attempt all.
2. Submit your work (in .pdf) on the Moodle. The required format of your filename is studentID_PT
3. You will get **TWO** bonus points if you submit this placement test by the deadline.
4. **This placement test is due on Friday 14th, at 11 AM. Late submission will not be accepted.**

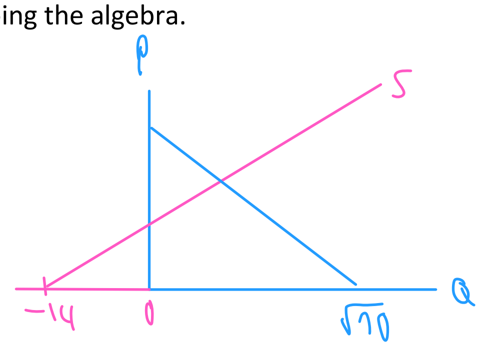
1. Suppose that market demand is given by $P = 10 - Q^2$ and the market supply is given by $Q = a + P$, where P is the unit price, Q is the quantity of output, and a is the coefficient in the supply equation.
   1.1) Graph the market demand and market supply curve in a P-Q diagram. Set the value of a equal to – 14.
   1.2) Solve for the market equilibrium quantity (Q*) and price (P*) when a = -14. Show your work.
   1.3) If "a" increases to -12, what would happen to the market equilibrium quantity and price? State the qualitative predictions without redoing the algebra.

1.1

$P = 10 - Q_d^2 \quad = \quad Q_d^2 = -P + 10$

$Q_s = P - 14 \qquad Q_d = \sqrt{-P + 10}$

$Q_s = -14 \qquad Q_d = \sqrt{10}$



1.2 $Q_d = Q_S$

$\left(\sqrt{10 - P}\right)^2 = (P - 14)^2$

$10 - P = P^2 - 28P + 196$

$0 = P^2 - 27P + 186$

$0 = ($

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2. Suppose that the revenue function is given by $R(Q) = \ln(Q^2 + 1) + 3\left(\frac{Q}{Q+1}\right), Q \geq 0$. Use the derivative technique and calculate the marginal revenue function. Is the revenue function an increasing or decreasing function?

$$R'(Q) = \frac{1}{Q^2+1} \cdot (Q^2+1)' + \left[3\,\frac{(Q+1(1)) - Q(1))}{(Q+1)^2} + \left(\frac{Q}{Q+1}\right)(1)\right]$$

$$= \frac{1}{Q^2+1} \cdot 2Q + \left[\frac{3Q+3-Q}{(Q+1)^2} + \frac{Q}{Q+1}\right] \#$$

i forgot how
to do laew ka (T-T)

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3. Suppose that the profit function is given by $\pi(Q) = -\frac{1}{3}Q^3 - Q^2 + 8Q - 1$ where Q is the level of output. Use the calculus and solve for the level of profit-maximizing output. Confirm your answer with the second derivative.

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4. Suppose that $A = \begin{bmatrix} 8 & 9 \\ 10 & 11 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, calculate the following object. Show your work.

4.1 A + B   not the same dimension #

4.2 A*B

$$= \begin{bmatrix} 8 & 9 \\ 10 & 11 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$$

$$= \begin{bmatrix} 8(1)+9(4) & 8(2)+9(5) & 8(3)+9(6) \\ 10(1)+11(4) & 10(2)+11(5) & 10(3)+11(6) \end{bmatrix} = \begin{bmatrix} 44 & 61 & 78 \\ 54 & 67 & 96 \end{bmatrix} \#$$

4.3 det(A)

$$A = \begin{bmatrix} 8 & 9 \\ 10 & 11 \end{bmatrix}$$

$$= 88 - 90 = -2$$

4.4 det(B)

$$B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \begin{matrix} 1 \\ 4 \end{matrix}$$

8 15 6

5 12 12

$$= (5+12+12) - (8+15+6)$$

$$= 29 - 29 = 0$$

4.5 det(C)

$$C = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \begin{matrix} 1 & 2 \\ 4 & 5 \\ 7 & 8 \end{matrix}$$

105 148 72

45 84 96

$$= (45+84+96) - (105+48+72)$$

$$= 225 - 225 = 0$$

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5. Suppose that $U(x, y) = x^a y^b + \ln\left(\frac{x}{x+y}\right)$. Use the partial derivative technique, calculate $\frac{\partial U}{\partial x}$ and $\frac{\partial U}{\partial y}$.

$\frac{\partial U}{\partial x} =$