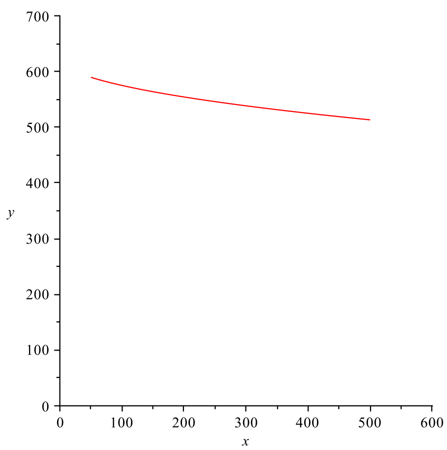
ANSWER KEY

(1) A
(2) B
(3) C
(4) D
(5) C
(6) B
(7) D
(8) C
(9) A
(10) C

(11)

(i) Graph of elementary function $y = \sqrt{x}$ gets reflected in the x-axis, vertically expanded by a factor of 5, and shifted up 625 units.

(ii) Plot of $p(x) = 625 - 5\sqrt{x}$. Note that the domain is restricted such that $x \in [50, 500]$



(12)

(i) To find the inverse of a function $y = f(x)$, switch the independent and dependent variables: $x = f(y)$ is its inverse.

(ii) In order for the inverse function to exist, $y = f(x)$ must be *one-to-one*. That is, each value in the range corresponds to exactly one value in the domain.

(13)

(i) Each firm's linear supply curve can be found by calculating the slope of each line and using point-slope form.

Firm one: Points: (2,6), (5,11) $\Rightarrow m = \frac{11-6}{5-2} = \frac{5}{3}$

$$\begin{aligned} y - y_1 = m(x - x_1) \Rightarrow y - 6 &= \frac{5}{3}(x-2) \\ y - 6 &= \frac{5}{3}x - \frac{10}{3} \\ y - \frac{5}{3}x &= -\frac{10}{3} + \frac{18}{3} \\ -5x + 3y &= 8 \end{aligned}$$

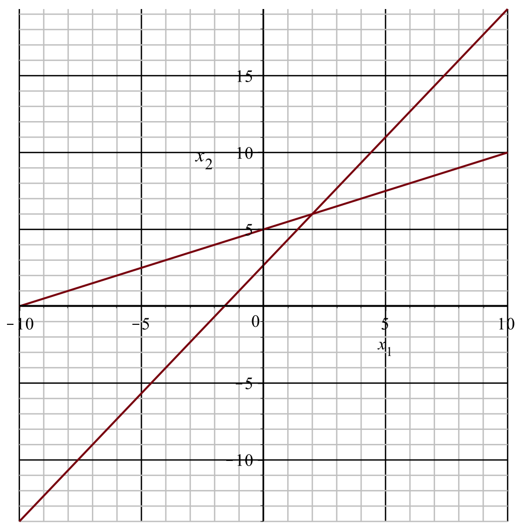
Firm two: Points: (4,7), (6,8) $\Rightarrow m = \frac{8-7}{6-4} = \frac{1}{2}$

$$\begin{aligned} y - y_1 = m(x - x_1) \Rightarrow y - 7 &= \frac{1}{2}(x-4) \\ y - 7 &= \frac{1}{2}x - 2 \\ y - \frac{1}{2}x &= -2 + 7 \\ x - 2y &= -10 \end{aligned}$$

Write down the linear system:
$$\begin{aligned} -5x + 3y &= 8 \\ x - 2y &= -10 \end{aligned}$$

(ii) As an augmented matrix: $\left[\begin{array}{cc|c} -5 & 3 & 8 \\ 1 & -2 & -10 \end{array}\right]$

(iii) (a) **Graphing**: Intersect at (2,6)



(b) **Substitution** (one possibility): From $-5x+3y=8$, solve for y: $y=\frac{8}{3}+\frac{5}{3}x$
Substitute into second equation:

$$x-2y=-10 \Rightarrow x-2(\frac{8}{3}+\frac{5}{3}x)=-10$$
$$x-\frac{16}{3}-\frac{10}{3}x=-10$$
$$-\frac{7}{3}x-\frac{16}{3}=-10$$
$$x=\frac{-30+16}{-7}=\frac{-14}{-7}=2$$

Substitute into first equation:

$$-5x+3y=8 \Rightarrow -5(2)+3y=8$$
$$-10+3y=8$$
$$y=\frac{8+10}{3}=6$$

(c) **Elimination by Addition** (one possibility):
Multiply second equation by 5: $5[x-2y=-10]=5x-10y=-50$

$$\begin{array}{rrrrrr} & -5x & + & 3y & = & 8 \\ + & 5x & - & 10y & = & -50 \\ \hline & & & -7y & = & -42 \end{array}$$

Add both equations: (above)

$\Rightarrow y=6$
Substitute $y=6$ into either equation to find $x=2$.

(d) **Augmented matrix** (one possibility): $\left[\begin{array}{rr|r} -5 & 3 & 8 \\ 1 & -2 & -10 \end{array}\right]$

$R_1+5R_2 \rightarrow R_2' \left[\begin{array}{rr|r} -5 & 3 & 8 \\ 0 & -7 & -42 \end{array}\right]$

$3R_2+7R_1 \rightarrow R_1' \left[\begin{array}{rr|r} -35 & 0 & -70 \\ 0 & -7 & -42 \end{array}\right] \Rightarrow \begin{array}{rcr} -35x & = & -70 \\ -7y & = & -42 \end{array} \Rightarrow \begin{array}{c} x=2 \\ y=6 \end{array}$

(14)

First investment: $P=$ \$5,300, $t=2.5$, $r=0.012$, $m\rightarrow\infty \equiv$ continuous compounding.
Solve for A:

$$\begin{aligned} A=Pe^{rt} &= 5,300e^{0.012\times 2.5} \\ &= 5,300e^{0.03} \\ &= 5,300(1.0304545) \\ &= \$5,461.41 \end{aligned}$$

Second investment: $P = A$ from first investment, or \$5,461.41, $t = 1$, $r = 0.02$, $m = 4$ (quarterly).

$$\begin{aligned} A &= P(1+\frac{r}{m})^{mt} = 5,461.41(1+\frac{0.02}{4})^{4*1} \\ &= 5,461.41(1+0.005)^4 \\ &= 5,461.41(1.02015050) \\ &= \$5,571.46 \end{aligned}$$

GRADING SCALE

Raw Score	Final Score
27.25	100
25.5	98.25
22.5	95.25
20.25	93
20	92.75
19.5	92.25
17	89.75
14.5	87.25
14.25	87
14	86.75
13	85.75
12.5	85.25
12	84.75
12	84.75
11.5	84.25
11	83.75
10	82.75
9	81.75
8	80.75
7.5	80.25
7	79.75
6	78.75
5.75	78.5
2	74.75

Max possible	32
Mean (avg)	13.23
Median	9.5