[5] 1. A movie theatre sells tickets for \$8.00 each, with seniors receiving a discount of \$2.00. One evening the theatre sold 525 tickets and took in \$3580 in revenue. How many of each type of ticket were sold?

[10] 2. A theatre has 500 seats, divided into orchestra, main and balcony seating. Orchestra seats sell for \$50, main seats for \$35 and balcony seats for \$25. If all the seats are sold the revenue to the theatre is \$17,100. If all the main and balcony seats are sold, but only half the orchestra seats are sold, the revenue is \$14,600. How many are there of each kind of seat?

[5] 3. Johnny sells hand-crafted leather belts at community festivals and craft fairs. His marginal cost to produce one belt is \$7.50 and his total cost to produce 100 belts is \$900.00. He sells the belts for \$15.00 each.

(a) Find the linear cost function for Johnny's leather belt production.

(b) How many leather belts must Johnny produce and sell to break even?

(c) How many belts must he produce and sell to make a profit of \$75.00?

[10] 4. Consider the line l whose equation is $-2x + y = 4$.

(a) Find an equation of the l_1 that passes through (3,1) and is parallel to l.

(b) Find an equation of the line l_2 that passes through (3,1) and is perpendicular to line l.

(c) Find the intersection of the line l_1 with the line passing through points (1, –2) and (2,3).

[5] 5. Find all 2 by 2 row reduced echelon form (RREF) matrices.

[10] 6. Determine which of the following matrices are in RREF. For the matrices that are not in RREF form, perform the necessary row operations to reduce them to RREF.

$$\mathrm{M}=\begin{bmatrix}1&0&0&0\\0&0&0&1\\0&0&0&0\end{bmatrix},\ \mathrm{N}=\begin{bmatrix}0&0&1\\1&0&0\\0&3&0\end{bmatrix},\ \mathrm{P}=\begin{bmatrix}1&0&3&0\\0&1&2&0\\0&0&0&1\end{bmatrix},\ \mathrm{Q}=\begin{bmatrix}0&0&0\\1&3&-1\\0&1&0\end{bmatrix},\ \mathrm{S}=\begin{bmatrix}0&1&2\\0&0&0\\1&1&1\end{bmatrix}$$

[5] 7. Use the Gauss-Jordan elimination procedure to solve the following system.

$$\begin{aligned} x-y+2z &= 3\\ -x+y-2z-w &= 0\\ 2x-y+2z+w &= -1 \end{aligned}$$

[10] 8. Consider the system of linear equations

$$x + ay = 1$$
$$2x + 8y = b$$

where *a* and *b* are real numbers.

(a) Write out the augmented matrix for this system of linear equations.

(b) Use elementary row operations to reduce the augmented matrix to row-echelon form.

(c) Determine for what values of a and *b* does the system have infinitely many solutions.

(d) Determine for what values of a and *b* does the system have no solution.

(e) Determine for what values of a and *b* does the system have an unique solution.