## 1 MATH 140 HOGU: Exam 1 Review

Problem 1. The top five baseball players at Texas A\&M have official game batting averages $(G)$ of $.365, .325, .279, .263$, and .248 , respectively. However, during their practices these same five players have batting averages $(P)$ of $.355, .348, .267, .265$, and .232 , respectively.
(a) Organize this information in a $5 \times 2$ matrix (call it $B$ ). Label each row and column of your matrix that signifies what each row and column number means.
(b) The baseball coach gives the players a goal to raise their batting averages by $3 \%$ next year, both in official play and in practice. Find a $5 \times 2$ matrix representing the batting averages that each of these top 5 players would need to have in order to meet the coach's goal. Round up your answers to the nearest thousandth.

Problem 2. Let $B=\left[\begin{array}{ccc}-15 v & -3 & -12 \\ 9 w & -5 r & 1\end{array}\right]$ and let $A=\left[\begin{array}{cc}-1 & 18 \\ -8 q & 4 \\ 12 m & 2 n\end{array}\right]$.
(a) Let $E=3 A^{T}-2 B$. Find $e_{12}$.
(b) Calculate $B A$.

Problem 3. Consider the line $7 x-3 y=11$. Circle the correct choice when prompted in the sentence below, then complete the sentence.
(a) If $y$ decreases by 7 units, $x$ (increases/decreases) by $\qquad$
(b) If $x$ increases by 11 units, $y$ (increases/decreases) by $\qquad$
(c) If $y$ increases by 3 units, $x$ (increases/decreases) by $\qquad$
(d) If $x$ decrease by 9 units, $y$ (increases/decreases) by $\qquad$

Problem 4. The demand equation for a sports watch is given by

$$
p=-0.025 x+50 .
$$

(a) Given this model, above what price will consumers not buy the watch?
(b) Given this model, how many people would demand this item if it were free?

Problem 5. The web server that https://reveille.tamu.edu/ is hosted on originally cost $\$ 12,000$ in the year 2001. In 2005 the server reached its scrap value of $\$ 6,000$.
(a) Compute the rate of depreciation of the web server.
(b) Let $t$ be the amount of time since 2001 (in years). Find a depreciation function $V(t)$ where $V$ is the value (in dollars) of the web server.
(c) In what year was the server worth $\$ 7500$ ?
(d) What was the value of the server in 2006?

Problem 6. A clumsy problem writer for MATH-140 has written two equations:

$$
p(x)=-\frac{1}{2} x+40 \quad \text { and } \quad p(x)=2 x+20
$$

where $x$ is the number of items sold or supplied. However, the writer has forgotten which equation is meant to be the supply function and which is meant to be the demand function!
(a) Which is the demand function and which is the supply function? Why?
(b) How many items will consumers demand if the items are prices at $\$ 10$ ?
(c) What is the equilibrium point of this item? Give your answer as an ordered pair.

Problem 7. Last October Taylor Swift was trying to decide how much to sell the vinyl album of 1989 (Taylor's Version) for, so she had her producer Jack Antonoff collect some data for her here at Texas A\&M. He reported back: a $\$ 20$ vinyl album would create a demand for 24,000 copies among A\&M students, but suppliers would only stock 8,000 copies at that price. However, for a $\$ 60$ vinyl album suppliers would carry 24,000 copies at their stores, but at exactly that price and above A\&M students would not buy the vinyl at all.
(a) Compute the supply function $p(x)$, where $x$ is the number of vinyl albums sold.
(b) Determine the demand function $p(x)$, where $x$ is as above.
(c) At what price would both students and vinyl album suppliers be happy?

Problem 8. Solve the system of equations given below using the stated methods:

$$
\begin{gathered}
2 x-y=1 \\
3 x+2 y=12
\end{gathered}
$$

(a) Use the Substitution Method to solve.
(b) Use the Addition Method to solve.

Problem 9. Fill in the table below.

| Line | $x$ - intercept $(y=0)$ | $y$-intercept $(x=0)$ |
| :---: | :---: | :---: |
| $\frac{5}{4} x-\frac{2}{3} y=3$ | $\left(\begin{array}{c} \\ \hline\end{array}\right)$ | $()$, |
| $\frac{1}{4} x+\frac{5}{3} y=6$ | $()$, | $()$, |

Graph each line on the plot below.


What is the intersection of these two lines?

Problem 10. The Aggie football bobblehead manufacturer manufactures a bobblehead at a cost of $\$ 4$ a unit and sells them for $\$ 10$ a unit. If making 1,000 bobbleheads costs the manufacturer $\$ 16,000$ in total, compute their break-even point. Interpret what your answer means in the context of this problem.

Problem 11. Texas A\&M is starting a chain of Aggie-Strong Protein Shakes! There are small and large versions of these protein shakes. A batch of small shakes takes 20 minutes to prepare and 15 minutes to blend. A batch of large shakes takes 30 minutes to prepare and 30 minutes to blend. Texas A\&M has 3,900 minutes dedicated to preparing the shakes and 3,300 minutes dedicated to blending. If they want to fully utilize all of these minutes, how many batches of each version (small or large) of the protein shake should they make?
(a) Let $x$ be the number of minutes the chain spends preparing protein shakes. Let $y$ be the number of minutes the chain spends blending protein shakes. Write a system of two equations describing this situation.
(b) How many batches of each type of shake they should produce?

