

# Maths Exercises

# Linear Algebra- Problems

1. What is the transpose of this vector?

$$\begin{bmatrix} 25 \\ 2 \\ -3 \\ -23 \end{bmatrix}$$

2. Using algebraic notation, what are the dimensions of this matrix **Y**?

$$Y = \begin{bmatrix} 42 & 4 & 7 & 99 \\ -99 & -3 & 17 & 22 \end{bmatrix}$$

3. Using algebraic notation, what is the position of the element in this matrix **Y** with the value of 17?

# Linear Algebra Problem

4. If the vector  $u = (-2, 0)$ , the vector  $v = (1.5, 1.5)$ , and the vector  $w = (4, 1)$ ,

What are the results of  $u + v$ ,  $v + w$ , and  $u + w$ ?

What is the result of  $u + v + w$ ?

# Linear Algebra - Problem

Jill designs solar panels as a hobby

On April 1<sup>st</sup>, Jill's "Mark I" design begins generating power: 1 kJ/day.

On May 1<sup>st</sup>, her "Mark II" design begins generating 4 kJ of power per day.

1. What day is it when Jill's Mark II design has generated as much total energy as the Mark I design?
2. How much total energy have both generated by that day?
3. What would the solutions to (1) and (2) be if Mark II design generated 1kJ of power per day?

# Calculus - Problem

1. Differentiate  $y = -5x^3$
2. Differentiate  $y = 2x^2 + 2x + 2$
3. Differentiate  $y = 10x^5 - 6x^3 - x - 1$
4. Use paper and pencil (i.e., the derivative rules) to find the slope of  $y = x^2 + 2x + 2$  where  $x = 2$  and, separately, find the slope where  $x = -1$

# Calculus - Problem

1. Use the product rule to find  $f'(x)$  where  $y = (2x^2 + 6x)(2x^3 + 5x^2)$
2. Use the quotient rule to find  $y'$  where  $y = 6x^2/(2 - x)$
3. Differentiate  $y = (3x + 1)^2$
4. Find  $y'$  where  $y = (x^2 + 5x)^6$
5. Differentiate  $f(x) = 1/((x^4 + 1)^5 + 7)$

# Statistics- Exercise

Write a short note on the following

- $z$ -scores and Outliers
- $p$ -values
- Comparing Means with  $t$ -tests
- Confidence Intervals
- ANOVA: Analysis of Variance
- Null hypothesis
- Alternate hypothesis

# Probability – Exercise

Write a short note on the following

- Random Variables
- Discrete vs Continuous Variables
- Probability Mass and Probability Density Functions
- Expected Value