

Test 1

Question 1. (8 marks)

(a) Simplify using positive exponents only:

$$\frac{(a^{-2}b^3)^{-4}}{a^2(a^3b)^{-1}}$$

(b) Solve for T_1 in the equation:

$$R = \frac{A(T_2 - T_1)}{H}$$

Question 2. (8 marks)

(a) Given $f(x) = 2x^2 + 5x - 1$ find

$$\frac{f(x+h) - f(x)}{h}$$

(b) Find the domain and range of the function: $f(x) = \frac{1}{\sqrt{x+2}}$

Question 3. (9 marks)

(a) Solve the following equation:

$$1 - \frac{12}{x^2 - 4} = \frac{3}{x + 2}$$

(b) Graph $y = -x^2 + 4x + 12$.

Question 4. (8 marks)

(a) Convert 1015.76 cm/min^2 to m/s^2 .

(b) Determine how many years there are in a Ts.

(c) Perform the following operation on the approximate numbers: $3.73 - 2.115546 + 1.444$

(d) Determine which of the pair of approximate numbers is more precise and which is more accurate: 136.1 ; 0.3142 .

Question 5. (12 marks)

a Solve the following system using Cramer's rule:

$$\begin{aligned} 6a - 8b &= 6 \\ -3a + 2b &= -2 \end{aligned}$$

(b) Solve the following system algebraically:

$$\begin{aligned} 2x + y + z &= 4 \\ x - 2y - z &= 3 \\ 3x + 3y - 2z &= 1 \end{aligned}$$

(c) Solve for z in the following system using Cramer's rule (you do not need to find x or y):

$$\begin{aligned} 2x + y + 2z &= 8 \\ 3x - 2y - 4z &= 5 \\ -2x + 3y + 4z &= -3 \end{aligned}$$

Prefix	Factor	Symbol	Prefix	Factor	Symbol
exa	10^{18}	E	deci	10^{-1}	d
peta	10^{15}	P	centi	10^{-2}	c
tera	10^{12}	T	milli	10^{-3}	m
giga	10^9	G	micro	10^{-6}	μ
mega	10^6	M	nano	10^{-9}	n
kilo	10^3	k	pico	10^{-12}	p
hecto	10^2	h	femto	10^{-15}	f
deca	10^1	da	atto	10^{-18}	a

TEST 1 SOLUTIONS

$$(a) \frac{(a^{-2}b^3)^{-4}}{a^2(a^3b)^{-1}} = \frac{a^8b^{-12}}{a^2a^{-3}b^{-1}} = \frac{a^8a^3b}{a^2b^{12}} = \frac{a^9}{b^{11}}$$

$$b) R = \frac{A(T_2 - T_1)}{H} \Rightarrow HR = A(T_2 - T_1)$$

$$\Rightarrow \frac{HR}{A} = T_2 - T_1 \Rightarrow -T_2 + \frac{HR}{A} = -T_1$$

$$\Rightarrow T_2 - \frac{HR}{A} = T_1$$

$$2) a) \frac{f(x+h) - f(x)}{h} = \frac{[2(x+h)^2 + 5(x+h) - 1]}{h} - (2x^2 + 5x - 1)$$

$$= \frac{2(x^2 + 2xh + h^2) + 5x + 5h - 1 - 2x^2 - 5x + 1}{h}$$

$$= \frac{\cancel{2x^2} + 4xh + 2h^2 + \cancel{5x} + 5h - \cancel{1} - \cancel{2x^2} - \cancel{5x} + \cancel{1}}{h}$$

$$= \frac{4xh + 2h^2 + 5h}{h} = 4x + 2h + 5$$

$$b) \text{DOMAIN: } x+2 > 0 \Rightarrow x > -2$$

\therefore DOMAIN IS ALL REAL NUMBERS x SUCH THAT $x > -2$

RANGE: ALL REAL NUMBERS y SUCH THAT $y > 0$

$$3) a) 1 - \frac{12}{x^2-4} = \frac{3}{x+2}$$

$$1 - \frac{12}{(x+2)(x-2)} = \frac{3}{x+2} \quad \text{LCD} = (x+2)(x-2)$$

$$(x+2)(x-2) \cdot 1 - \cancel{(x+2)} \cancel{(x-2)} \cdot \frac{12}{\cancel{(x+2)} \cancel{(x-2)}} = \frac{3}{x+2} (x+2)(x-2)$$

$$(x^2-4) - 12 = 3(x-2)$$

$$x^2-4-12 = 3x-6$$

$$x^2-4-12-3x+6 = 0$$

$$x^2-3x-10 = 0$$

$$(x-5)(x+2) = 0$$

$$\therefore x-5=0, \quad x+2=0$$

$$x=5$$

VALID

$$x=-2$$

NOT VALID

$$\therefore x=5$$

$$b) y = -x^2 + 4x + 12$$

$$y\text{-int: } x=0$$

$$y = -(0)^2 + 4(0) + 12$$

$$y = 12$$

$$\therefore (0, 12)$$

$$x\text{-int: } y=0$$

$$0 = -x^2 + 4x + 12$$

$$x^2 - 4x - 12 = 0$$

$$(x-6)(x+2) = 0$$

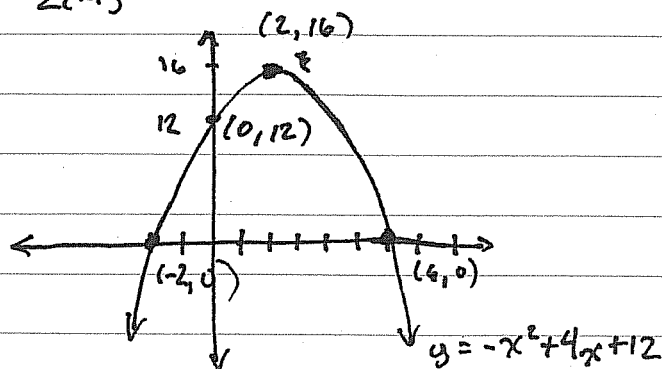
$$\therefore x-6=0$$

$$x=6$$

$$\therefore x+2=0$$

$$x=-2$$

$$\text{VERTEX: } x = \frac{-b}{2a} = \frac{-(4)}{2(-1)} = 2, \quad y = -(2)^2 + 4(2) + 12 = 16 \quad \therefore (2, 16)$$



$$4) a) 1015.76 \frac{\text{cm}}{\text{min}^2} \left(\frac{\text{m}}{100\text{cm}} \right) \left(\frac{\text{min}}{60\text{s}} \right)^2$$

$$= 2.82156 \times 10^{-3} \text{ m/s}^2$$

$$b) 1\text{T} = 10^{12} \text{ s} = 10^{12} \text{ s} \left(\frac{\text{min}}{60\text{s}} \right) \left(\frac{\text{hr}}{60\text{min}} \right) \left(\frac{\text{day}}{24\text{hr}} \right) \left(\frac{\text{year}}{365\text{d}} \right)$$

$$= 31709 \text{ years } \&$$

$$c) 3.73 - 2.115546 + 1.444 = 3.05$$

d) 136.1, 0.3142 HAVE THE SAME ACCURACY
0.3142 IS MORE PRECISE

$$5) a) a = \frac{\begin{vmatrix} 6 & -8 \\ -2 & 2 \end{vmatrix}}{\begin{vmatrix} 6 & -8 \\ -3 & 2 \end{vmatrix}} = \frac{(6)(2) - (-8)(-2)}{(6)(2) - (-3)(-8)} = \frac{-4}{-12} = \frac{1}{3}$$

$$b) b = \frac{\begin{vmatrix} 6 & 6 \\ -3 & -2 \end{vmatrix}}{\begin{vmatrix} 6 & -8 \\ -3 & 2 \end{vmatrix}} = \frac{(6)(-2) - (-6)(-3)}{-12} = \frac{6}{-12} = -\frac{1}{2}$$

~~$$b) \begin{array}{r} 4x + 2y + 4z = 16 \\ + (3x - 2y - 4z = 5) \\ \hline 7x = 21 \\ x = 3 \end{array}$$~~

~~$$\begin{array}{r} 6x + 3y + 3z = 12 \\ - (3x + 3y - 2z = 1) \\ \hline 3x + 5z = 11 \end{array}$$~~

$$\begin{array}{r}
 b) \quad (1) \times 2 \quad 4x + 2y + 2z = 8 \\
 \quad \quad \quad \quad + (x - 2y - z = 3) \\
 \hline
 (1') \quad 5x \quad \quad + z = 11
 \end{array}$$

$$\begin{array}{r}
 (1) \times 3 \quad 6x + 3y + 3z = 12 \\
 \quad \quad \quad - (3x + 3y - 2z = 1) \\
 \hline
 (2') \quad 3x \quad \quad + 5z = 11
 \end{array}$$

$$\begin{array}{r}
 (1') \times 5 \quad 25x + 5z = 55 \\
 \quad \quad \quad - (3x + 5z = 11) \\
 \hline
 22x \quad \quad = 44 \\
 x \quad \quad = 2
 \end{array}$$

$$\begin{array}{l}
 \text{FROM } (1') : 5(2) + z = 11 \\
 z = 11 - 10 \\
 z = 1
 \end{array}$$

$$\begin{array}{l}
 \text{FROM } (1) : 2(2) + y + (1) = 4 \\
 y = 4 - 1 - 4 \\
 y = -1
 \end{array}$$

$$\therefore x = 2, y = -1, z = 1$$

$$c) \begin{vmatrix} 2 & 1 & 8 \\ 3 & -2 & 5 \\ -2 & 3 & -3 \end{vmatrix} = \frac{21}{14} = \frac{3}{2}$$

$$z = \begin{vmatrix} 2 & 1 & 2 \\ 3 & -2 & -4 \\ -2 & 3 & 4 \end{vmatrix}$$

$$\begin{vmatrix} 2 & 1 & 8 \\ 3 & -2 & 5 \\ -2 & 3 & -3 \end{vmatrix} = (2)(-2)(-3) + (1)(5)(-2) + (8)(3)(3) - (8)(-2)(-2) - (2)(5)(3) - (1)(3)(-3) = 21$$

$$\begin{vmatrix} 2 & 1 & 2 \\ 3 & -2 & -4 \\ -2 & 3 & 4 \end{vmatrix} = (2)(-2)(4) + (1)(-4)(-2) + (2)(3)(3) - (2)(-2)(-2) - (2)(-4)(3) - (1)(3)(4) = 14$$