

# MATH 171 - TEST 1 SOLUTIONS

①

$$\textcircled{1} \quad (a) \quad \frac{3t^{-1}}{(3t)^2} = \frac{3}{t(3t)^2} = \frac{3}{t(9t^2)} = \boxed{\frac{1}{3t^3}}$$

$$(b) \quad \frac{(2xy^3)^{-3}}{x^{-2}y^{-1}} = \frac{x^2y}{(2xy^3)^3} = \frac{x^2y}{8x^3y^9} = \boxed{\frac{1}{8xy^8}}$$

$$\begin{aligned} (c) \quad & [6(-3^{-1}x^2y)^2x^{-1}]^2 \\ &= 6^2(-3^{-1}x^2y)^4x^{-2} \\ &= 36((-3^{-1})^4x^8y^4)x^{-2} \\ &= 36(-1)^43^{-4}x^8y^4x^{-2} \\ &= 36\left(\frac{1}{3^4}\right)x^6y^4 \\ &= \frac{36}{81}x^6y^4 = \boxed{\frac{4}{9}x^6y^4} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad (a) \quad & 5.36 \times 10^{-3} + 7.32 \times 10^{-4} \\ &= \boxed{6.092 \times 10^{-3} \text{ Sci}} \\ &= \boxed{6.092 \text{ m ENG}} \end{aligned}$$

$$(b) \left( \frac{\sqrt{56K} - 4.32 \times 10^2}{5.43 \times 10^3} \right)^{-3}$$

$$= \left( \frac{\sqrt{56 \times 10^3} - 4.32 \times 10^2}{5.43 \times 10^3} \right)^{-3}$$

$$= \left( \frac{236.643 - 432}{5430} \right)^{-3}$$

$$= -21473.98$$

$$= \boxed{-2.147 \times 10^4 \text{ sci}}$$

$$= -21.47 \times 10^3$$

$$= \boxed{-21.47 \text{ K Eng}}$$

$$(c) \frac{12 \times \sqrt{34m} - 56.7 \times 10^{-1}}{(-0.89K)^{-2} - \left( \frac{87.6\mu}{-54m} \right)^2}$$

$$= \frac{12 \times \sqrt{34 \times 10^{-3}} - 56.7 \times 10^{-1}}{(-0.89 \times 10^3)^{-2} - \left( \frac{87.6 \times 10^{-6}}{-54 \times 10^{-3}} \right)^2}$$

$$= \frac{-3.4573}{1.2625 \times 10^{-6} - 2.6316 \times 10^{-6}}$$

$$= \frac{-3.4573}{-1.3691 \times 10^{-6}} = \boxed{2.525 \times 10^6 \text{ sci}}$$

3

3

$$\begin{array}{r}
 -4x^3 + 8x + 12 \\
 \hline
 2x-3 \quad -8x^4 + 12x^3 + 16x^2 - 14 \\
 \quad -(-8x^4 + 12x^3) \\
 \hline
 0x^3 + 16x^2 - 14 \\
 \quad - (16x^2 - 24x) \\
 \hline
 24x - 14 \\
 \quad - (24x - 36) \\
 \hline
 22
 \end{array}$$

Answer: 
$$-4x^3 + 8x + 12 + \frac{22}{2x-3}$$

4

VARIABLE	UNIT	SOLUTION 1	SOLUTION 2	FINAL SOLN
% WATER	ml/ml	40	75	62
AMOUNT OF SOLN	ml	x	300-x	300
AMOUNT OF WATER	ml	0.4x	0.75(300-x)	0.62(300) = 186

$$0.4x + 0.75(300-x) = 186$$

$$0.4x + 225 - 0.75x = 186$$

$$-0.35x = -39$$

$$x = 111.43 \text{ mL}$$

SOLN 2:  $300 - x = 188.57 \text{ mL}$  must be added

4

5

(a) domain  $x > 5$   
 Range  $f(x) > 0$

(b) domain  $\mathbb{R}$   
 Range  $f(x) \geq -6$

6

$$f(-2) = 2(-2)^2 + -3(-2)$$

$$= 8 + 6 = \boxed{14}$$

$$f(x-2) = 2(x-2)^2 - 3(x-2)$$

$$= 2(x^2 - 4x + 4) - 3x + 6$$

$$= 2x^2 - 8x + 8 - 3x + 6$$

$$= \boxed{2x^2 - 11x + 14}$$

$$f(2x) - 2f(x) = 2(2x)^2 - 3(2x) - 2(2x^2 - 3x)$$

$$= 8x^2 - 6x - 4x^2 + 6x$$

$$= \boxed{4x^2}$$

$$\frac{f(x+h) - f(x)}{h} = \frac{2(x+h)^2 - 3(x+h) - (2x^2 - 3x)}{h}$$

$$= \frac{2x^2 + 4xh + 2h^2 - 3x - 3h - 2x^2 + 3x}{h}$$

$$= \boxed{\frac{4xh + 2h^2 - 3h}{h}}$$

7

$$\text{slope } m = \frac{4-2}{-2-(-1)} = \frac{2}{-1} = -2$$

$$y = -2x + b$$

point (-1, 2)

$$2 = -2(-1) + b$$

$$2 = 2 + b$$

$$b = 0$$

$$y = -2x$$

The line  $2y - 6 = x$

$$2y = x + 6$$

$$y = \frac{1}{2}x + 3$$

has slope  $\frac{1}{2}$  the negative reciprocal of  $-2$

so the lines **ARE PERPENDICULAR**

8

$$x + y + z = 5 \quad \textcircled{1}$$

$$2x - y - z = -8 \quad \textcircled{2}$$

$$x + 2y + 3z = 15 \quad \textcircled{3}$$

isolate  $x$  in  $\textcircled{1}$        $x = 5 - y - z$

sub in  $\textcircled{2}$  &  $\textcircled{3}$

$$2(5 - y - z) - y - z = -8$$

$$10 - 2y - 2z - y - z = -8$$

$$-3y - 3z = -18 \quad \textcircled{a}$$

$$5 - y - z + 2y + 3z = 15 \quad \textcircled{b}$$

$$y + 2z = 10$$

6

We now have

$$-3y - 3z = -18 \text{ (a)}$$

$$y + 2z = 10 \text{ (b)}$$

Isolate y in (b)

$$y = 10 - 2z$$

sub in (a)

$$-3(10 - 2z) - 3z = -18$$

$$-30 + 6z - 3z = -18$$

$$3z = 12$$

$$z = 4$$

$$y = 10 - 2(4) = 2$$

sub in (1)  $x + y + z = 5$

$$x + 2 + 4 = 5$$

$$x = -1$$

The soln is

$$(x, y, z) = (-1, 2, 4)$$

BONUS

8:15 AM - 9:05 AM

is 50 minutes

TOTAL time travelling  $50 - 15 = 35$  min.

(take 15 mins for mom to arrive)

VARIABLE	UNIT	WALK	CAR
speed	Km/hr	5	40
distance	Km	x	x

← equal distance he stops halfway

$$\text{Time} = \frac{\text{distance}}{\text{speed}}$$

$$\frac{x}{5} + \frac{x}{40} = \frac{35}{60}$$

( $\frac{35}{60}$  is hours)

$$x = 2.59 \text{ km}$$

$$\text{distance} = 2x = 5.19$$