MATHEMATICS METHODS : UNITS 1 & 2, 2019

Test 2 – (10%)

(1.1.1 – 1.1.28)

Time Allowed	First Name	Surname	Marks
25 minutes			28 ~~30~~ marks

Circle your Teacher's Name: *Mrs* Benko   *Mrs* Bestall   *Mrs* Fraser-Jones   *Mrs* Goh

Mr Koulianos   *Ms* Murray   *Mr* Rudland

Assessment Conditions: *(N.B. Sufficient working out must be shown to gain full marks)*

❖ Calculators: Allowed

❖ Formula Sheet: Provided

❖ Notes: Not Allowed

CALCULATOR Assumed

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1. [2 marks]

    A relation consists of the ordered pairs: (-3,4) ,(-1,5), (0,-2), (1,4) and (6,8). Is the relation a function? Explain.

    Yes ✓ Answer

    for every x there is 1 y value. ✓ Reason " one to one

2. [5 marks]

    Express $y = 4x^2 + 8x - 7$ in the form $y = a(x + b)^2 + c$ and hence give its domain and range.

    $$y = 4\left(x + \frac{8}{2 \times 4}\right)^2 + \left(-7 - \frac{8^2}{4 \times 4}\right)$$

    $$= 4(x+1)^2 - 7 - 4 \qquad a\ \checkmark$$
    $$\qquad\qquad\qquad\qquad b\ \checkmark$$
    $$= 4(x+1)^2 - 11 \qquad c\ \checkmark$$

    Domain $\{x \in \mathbb{R}, \text{All } x\}$ Domain ✓

    Range $\{y \in \mathbb{R}, y \geq -11\}$ Range ✓

3. [3 marks]

The stress on an object is inversely proportional to its area. If a rectangle measuring 4 metres by 6 metres is under a stress of 60 N/m². Find the stress a 3 m square would encounter with the same force.

$$S \propto \frac{1}{A}$$

$$S = \frac{K}{A}$$

$$60 = \frac{K}{24}$$

$$K = 1440$$

$$S = \frac{1440}{9}$$

$$= 160 \, N/m^2$$

✓ Inverse proportion statement

✓ Value K

✓ Value S.

4. [4 marks]

The equation of the path of a cricket ball is $y = 1.1x - \frac{x^2}{50}$ where x and y are the horizontal distance travelled and the vertical height respectively in metres. Find, ~~to the nearest cm,~~ the greatest vertical height reached and the horizontal distance travelled.

Classpad allowed

✓✓ horizontal

// max height

(Units -1)

$$0 = x\left(1.1 - \frac{x}{50}\right)$$

$$x = 0 \quad or \quad x = 55m$$

∴ horizontal distance 55m

$$y = 1.1 \times 27.5 - \frac{27.5^2}{50}$$

$$= 15.125 \, m$$

∴✓ Vertical height 15.125 m

5. [3 marks]

Find the x-intercept of the line parallel to $5x - 2y + 10 = 0$ with a y intercept of (0,-7).

✓ $m = \frac{5}{2}$

✓ $y = \frac{5}{2}x - 7$

✓ $\left(\frac{14}{5}, 0\right)$ as co-ord.

$$2y = 5x + 10$$

$$y = \frac{5}{2}x + 5 \quad M = \frac{5}{2}$$

$$y = \frac{5}{2}x - 7$$

$$x = \frac{14}{5} \quad \left(\frac{14}{5}, 0\right)$$

6. [3 marks]

Find the value(s) of m if the quadratic equation $x^2 - 2mx + 3 = 0$ has only one solution.

$$\Delta = 0$$

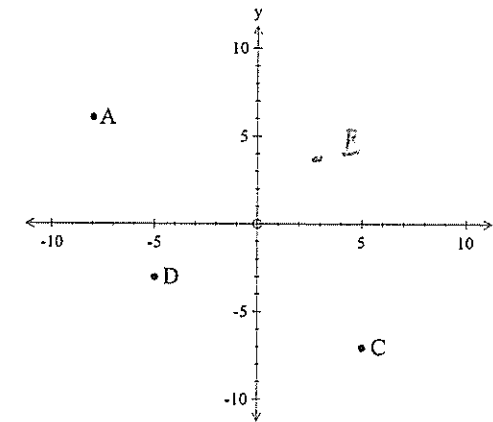$$4m^2 - 12 = 0$$

$$M = \pm\sqrt{3}$$

✓ correct expression for Δ

✓ equates Δ to 0

✓ gives both values.

7. [1, 2, 3 and 2 marks]

A(-8,6), B(a,b), C(5,-7) and D(-5,-3) are the vertices of a quadrilateral with diagonals AC and BD.

a. Find the mid-point of AC.

$$\left(-\frac{3}{2}, \frac{-1}{2}\right)$$ ✓

b. Find the co ordinates of B, given the diagonals of ABCD bisect each other.

$$-\frac{3}{2} = \frac{a + (-5)}{2} \qquad -\frac{1}{2} = \frac{b + (-3)}{2}$$

$$a = 2 \qquad b = 2$$

(2, 2)

✓ Sets up one mid pt equation

✓ Solves a + b

✓ Gives co-ord

c. Find the equation of the line perpendicular to DC, and passing through D.

$$M_{DC} = \frac{-3 + 7}{-5 - 5} = \frac{4}{-10} = -\frac{2}{5}$$ ✓ find M_{DC}

$$M = \frac{5}{2}$$ ✓ ⊥ m

$$y = -3 = \frac{5}{2}(x - -5)$$

$$y + 3 = \frac{5}{2}x + \frac{25}{2}$$

$$y = \frac{5}{2}x + \frac{19}{2}$$ ✓ gives lines.

Space

d. Does B lie on the line found in question c, show reasoning.

$$x = 2 \qquad y = 2.5 \times 2 + 9.5$$ ✓ Reasoning

$$= 14.5$$

No ✓

Response

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Circle your Teacher's Name: M/S Benko   Bestall   Fraser-Jones   Goh

Koulianos   Murray   Rudland

Assessment Conditions:	*(N.B. Sufficient working out must be shown to gain full marks)*
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CALCULATOR FREE

1. [3 and 3 marks] ⬭Solve⬭

a. $\dfrac{5y+1}{4} = 6 - \dfrac{2y}{3}$

$3(5y+1) = 72 - 8y$

$15y + 3 = 72 - 8y$

$23y = 69$

$y = 3$

✓ mult 12
✓ Expands
✓ Solves for y

↓ space

b. $x^2 + 2x = 15$

$x^2 + 2x - 15 = 0$

$(x+5)(x-3) = 0$

$x = -5$ or $x = 3$

✓ equates to zero
✓ factors
✓ solves for x.

2. [4 and 5 marks]
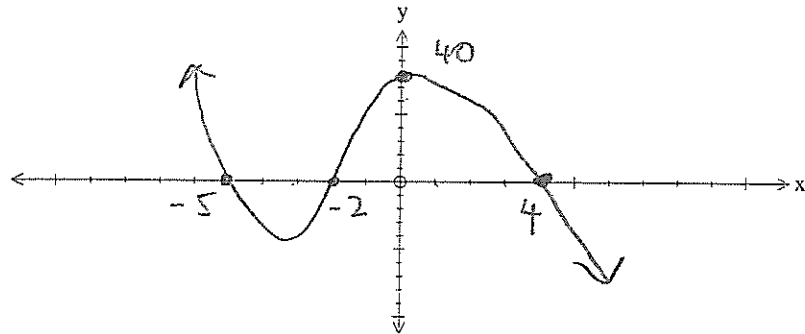
Given $x^3 + 3x^2 - 18x - 40 = (x + a)(bx^2 + cx - 8)$

a. Find the value of a, b and c.

$a = 5$ ✓ $(x+5)(x^2 + cx - 8)$

$b = 1$ ✓ $5x^2 + cx^2 = 3$ ✓

$c = -2$ ✓
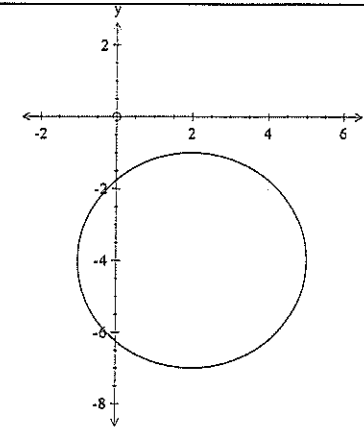
sets up equation to find "c" ✓

a ✓

b ✓

c ✓

b. Hence sketch $y = 40 + 18x - 3x^2 - x^3$, showing x and y intercepts.

$y = -(x+5)(x^2 - 2x - 8)$

$= -(x+5)(x+2)(x-4)$

✓ Expresses y in terms of "part a"

✓ Factors quadratic

✓ $(-5, 0)$
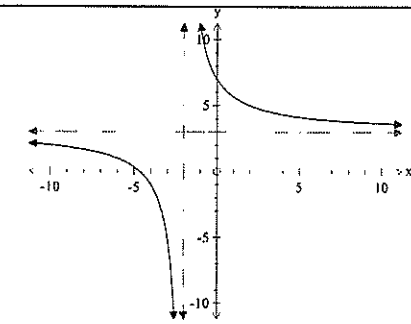
✓ other x intercepts

✓ y intercept

3. [10 marks]

Using the graph supplied, find the value of the constants in each of the equations below:

$(x + a)^2 + (y + b)^2 = c$
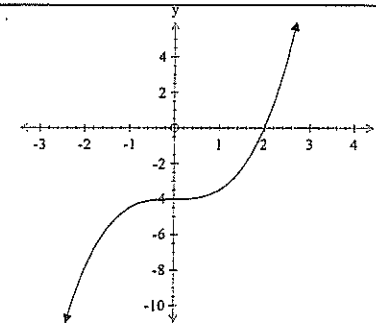
a = -2

b = 4

c = 9

$y = \dfrac{d}{x + e} + f$ $(0, 7)$
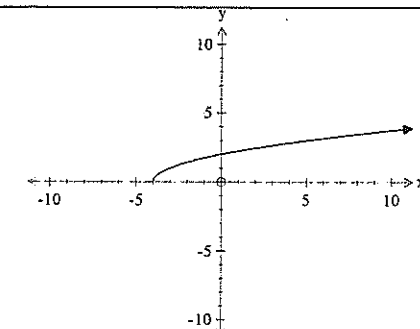
d = 8

e = 2

f = 3

$7 = \dfrac{d}{0 + 2} + 3$

$y = g(x + h)^3 + i$ $(2, 0)$

g = $\frac{1}{2}$

h = 0

i = -4

$y = g x^3 - 4$

$0 = 8g - 4$

$g = \frac{1}{2}$

$y = \sqrt{x + j}$

j = -4