GRADE 11   **JUNE 2018**

QUESTION 1

1.1.1. $x(x-3) = 0$

$x = 0$ or $x = 3$

1.1.2. $3x^2 = 2x + 3$

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

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \dfrac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-3)}}{2(3)}$

$\dfrac{2 \pm \sqrt{40}}{9}$

$x = 1,39$ or $x = -0,72$

1.1.3. $-3x^2 + 2x - 8$

$3x^2 + 2x - 8 > 0$

$(3x - 4)(x + 3) > 0$

$x \le -2$ or $x \ge \tfrac{4}{3}$

$x \in (-\infty; -2]$ or $x \in [\tfrac{4}{3}; \infty)$

1.1.4. $(4x + 1)(x - 1) = (x + 1)(x + 1)$

$4x^2 - 3x - 1 = x^2 + 2x + 1$

$3x^2 - 5x - 2 = 0$

$(3x + 1)(x - 2) = 0$

$x = -\tfrac{1}{3}$ or $x = 2$

1.1.6. $(2\sqrt{2x - 1})^2 = (2x - 4)^2$

$\Rightarrow$ $8x - 4 = 4x^2 - 16x + 16$

$\Rightarrow$ $4x^2 - 24x + 20 = 0$

$\Rightarrow$ $x^2 - 6x + 5 = 0$

Memo

factors
answers 2   ②

std form

form & subs 4
one for each ans ④

std form
factors
one for each, must have 'or'. ④

equating

std form 4
factors
answers ④

multiplying

equation

$(x - 5)(x - 1) = 0$

$x = 5$ or $x = 1$ (reject).

1.1.6. $3^x \cdot 3^1 + 3^x = 36$

$3^x (3 + 1) = 36$

$3^x = 9$

$x = 2$

1.1.7. $x^3 - x^{3/2} - 2 = 0$

$(x^{3/2} - 2)(x^{3/2} + 1) = 0$

$x^{3/2} = 2$ or $x^{3/2} = -1$

$x = (2)^{2/3}$ no solution

$x = 1,59$

1.2. $x = 2y + 3$

$3(2y + 3)^2 - 5(2y + 3) = 16y + 24$

$3(4y^2 + 12y + 9) - 5(2y + 3) - 16y - 24$

$12y^2 + 36y + 27 - 10y^2 - 15y - 16y - 24 = 0$

$2y^2 + 5y + 3 = 0$

$(2y + 3)(y + 1) = 0$

$y = -\tfrac{3}{2}$ or $y = -1$

$x = 0$ or $x = 1$

1.3.1. $\dfrac{2^{2n+1} \cdot (2^2)^{2n-3}}{(2^4)^{2n-1}}$

$= \dfrac{2^{2n+2} \cdot 2^{2n-9}}{2^{8n-4}}$

$= 2^{-3}$

$= \dfrac{1}{8}$

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factors
answers 4   ④

factors
simplify 3
answer ③

factors
equations,
no solution
answer 4   ④

solve
subs

std form.
factors. 6
y values.
x values.   ⑥

prime factors.
remove brackets.
answer 3   ③

Column 1

3.1. ....

$20 - 4k < 0$

$-4k < -20$

$k > 5.$

3.2.

$\Delta = b^2 - 4ac$

$\Delta = (5)^2 - 4(3)(-2)$ ✓

$\Delta = 49.$

$\Delta = 7^2$ ✓

∴ Roots are real, unequal and rational ✓

3.3.

$(p-1)x^2 + 4x + (p-1) = 0$ ✓

$\Delta = b^2 - 4ac$

$\Delta = (4)^2 - 4(p-1)(p-1)$ ✓

$\Delta = 16 - 4(p^2 - p - p + 1)$

$\Delta = 16 - 4p^2 + 8p - 4 \ldots$

$\Delta = -4p^2 + 8p + 12$ ✓

$\Delta = 0 = -4p^2 + 8p + 12 = 0$

$p^2 - 2p - 3 = 0$

$(p-3)(p+1) = 0$ ✓

∴ $p = 3$ or $p = -1$ ✓

QUESTION 4

$-1 \quad -7 \quad -11 \quad -13$

$\quad -6 \quad\; -4 \quad\; -2$

$\qquad\quad 2 \qquad 2$

4.1. $\quad 2a = 2 \qquad a = 1$ ✓

$3(1) + b = -6 \qquad b = -9$ ✓

$1 - 9 + c = -1 \qquad c = 7$ ✓

$T_n = n^2 - 9n + 7.$ ✓

Column 2

1.3.2.

$\dfrac{1}{8} = 3^{-x+4}.$

$-x + 4 = \dfrac{\log \frac{1}{8}}{\log 3}$ ✓

$x = 5,89.$ ✓

QUESTION 2

2.1. $\left(\sqrt{9 \times 2} + \sqrt{4 \times 2} - 2\sqrt{25 \times 2}\right)^2$ ✓

$= \left(3\sqrt{2} + 2\sqrt{2} - 10\sqrt{2}\right)^2$ ✓

$= \left(-5\sqrt{2}\right)^2$ ✓

$= 50.$ ✓

2.2. $a^{1/2} \cdot a^{2/3} \cdot a^{-1/6}$ ✓

$= a$ ✓

2.3. $2x^{1/2}\left(3x^{1/2} - x^{-1/2}\right)$

$= 6x - 2.$ ✓

QUESTION 5.

4 , x , 2x+1 , 25

1st differ: 28-(2x+1) = 28-2x-1

x-4   x+1

27-2x

+5   -3x+26

2nd diff: 27-2x-(x+1) = 27-2x-x-1 = -1

equation **4**

answer **(4)**

5.1. +5 = -3x+26

$3x = 21$

$x = 7$

Question 6:

6.1.   -3

$x+2\ \overline{)\ -3x-14}$
$\quad\quad -3x-6$
$\quad\quad\quad -8$

✓ correct + method

$f(x) = \dfrac{-8}{x+2} - 3$

N.B. No mark for $\dfrac{-8-3(x+2)}{x+2}$

(1)

6.2. $x = -2$ -3
     $y = -3$

equation **2**
equation **2**
     (2)

6.3. $x=0$ $y=-7$

$y=0:\quad 0 = \dfrac{-8}{x+2} - 3$

$3(x+2) = -8$

$3x = -8-6$

$x = -\dfrac{14}{3}$

y value. **2**

equation **3**

x value. **2**

6.4. on answer sheet

6.5. $y = x + k$ (-2,-3)

$-3 = -2 + k$

$k = -1$

answer **(1)**

4.2. -1 ; 10 ; -7 ; 17 ; -11 ; 24 ; -15 ...

-1 ; -7 ; -11 ; -13 ...

and 10 ; 17 ; 24 ; 31 ...

$x-4$ +7 +7 +7

$T_n = 10 + (n-1)(7)$

$T_n = 7n + 3$ +3

T_n

$T_{524} \div 2 = T_{262}$

$T_{262} = 7(262) + 3$

$= 1837$

answer **(4)**

$n = 262$

4

NAME: MEMO.

Question 6.3.

$y = -3$

f^{-1}

(1)

-1

Question 7.1.

x int.
y int.
asym
shape

point

shape

y int

ha

$y = -6$

(4)

4

6.6. $y = x - 1$.
     $A(-4;6)$.

$y = -4 - 1$ $6 = x - 1$
$y = -5$ $7 = x$

$A'(7;-5)$.

2

x value.
y value.
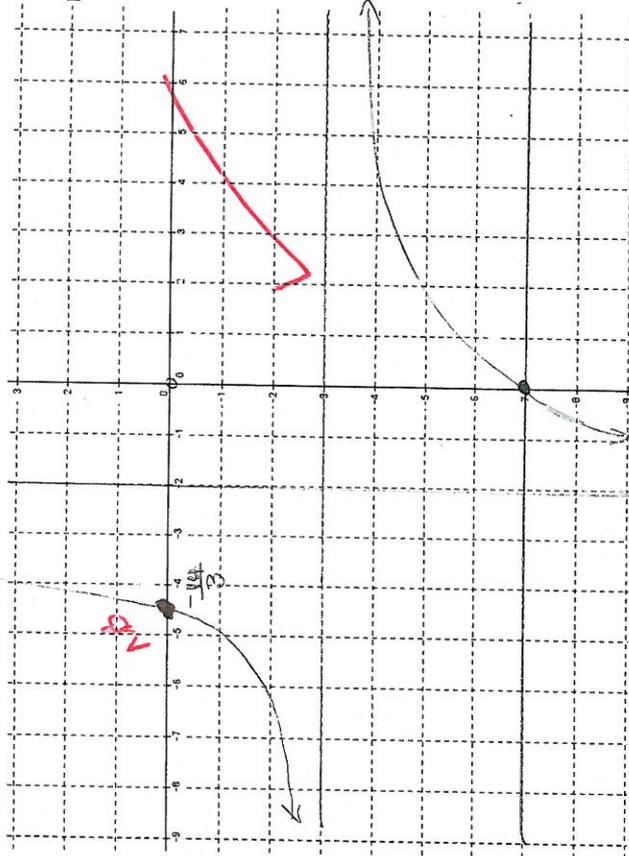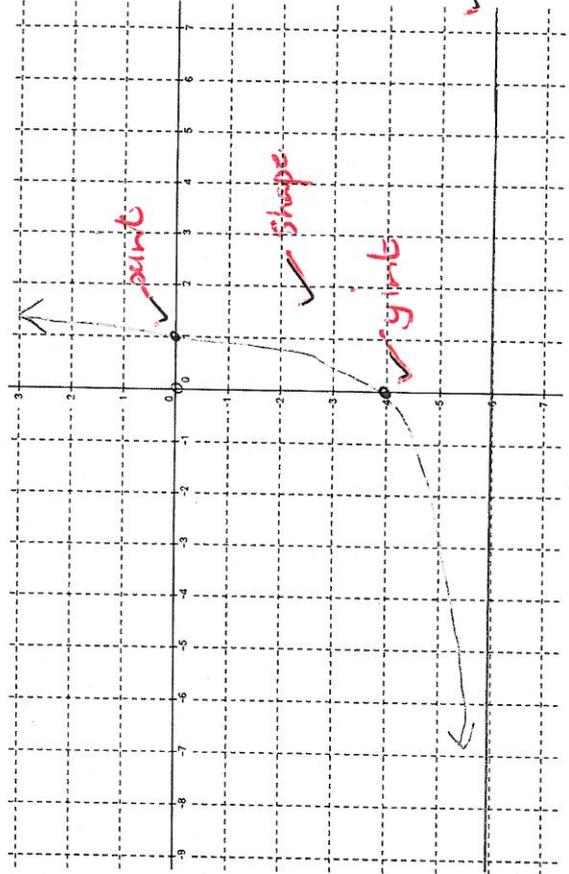
4

7.1. on answer sheet. ① answer — 1

7.2. increasing ✓ ↑ ① answer — 1

7.3. $y \in (-6; \infty)$ ✓ ↑ or $y > -6$. ✓ ② $x-4$ -11 -2

7.4. $y = 2 \cdot 3^{x-4} - 11$ ✓ ↑

QUESTION 8:

8.1. $f(x) = a(x-p)^2 + q$ ✓

$(-2;0)$ $y = a(x-1)^2 + q$

$0 = a(-2-1)^2 + q$

$-9 = a(-3)^2$ $\Rightarrow a = -1$ ✓

$y = -1(x^2 - 2x + 1) + q + 8$ ✓ p

$y = -x^2 + 2x + 8$ ✓ ↑

④ subs T.P. subs $(-2;0)$ x^2-2x+1

8.2. Simult. equation

$-x^2 + 2x + 8 = \tfrac{1}{2}x + 1$ ✓

$-x^2 + 2x + 8 - \tfrac{1}{2}x - 1 = 0$

$-x^2 + \tfrac{3}{2}x + 7 = 0$

$-2x^2 + 3x + 14 = 0$

$2x^2 - 3x - 14 = 0$ ✓

$(2x - 7)(x + 2) = 0$ ✓

$x = 7/2$ or $x = -2$ ✓

$y =$ $B\left(-\tfrac{1}{2}; \tfrac{11}{4}\right)$ ✓ 3.5 2.75

equation, std form ⑤ factors, x values, y values

8.3. $f(x) \geq g(x)$

$x \in \left[-2; \tfrac{1}{2}\right]$

or $-2 \leq x \leq \tfrac{1}{2}$ ✓ ↑ answer ① 5

8.4. $x = -2$ $y = 0$
$x = 1$ $y = 9$

$\text{grad} = \sqrt{}\ \dfrac{0-9}{-2-1} = 3$ ✓ gradient ②

8.5. $y = 0$ is x axis. ✓

$-y = -x^2 + 2x + 8$ ✓

$\Rightarrow y = x^2 - 2x - 8$ ✓ ↑ changing y answer ②

8.6. $-1 < -k-3 < 0$

$2 < -k < 3$

$-2 > k > -3$ ✓ ↑ answer ②

8.1. ⑥② pos $x=1$

$\dfrac{x_c + (-2)}{2} = 1$ $x_c - 2 = 2$

$x_c = 4$ ✓

Sub $T(1;9)$

$y = a(x+2)(x-4)$ ✓

$9 = a(1+2)(1-4)$ ✓

$9 = -9a$

$-1 = a$ ✓

$y = -1(x+2)(x-4)$

$= -(x^2 - 2x - 8)$

$= -x^2 + 2x + 8$ ✓ ↑

8.6. explanation → 5

8.6. $y = -x^2 + 2x + 8$
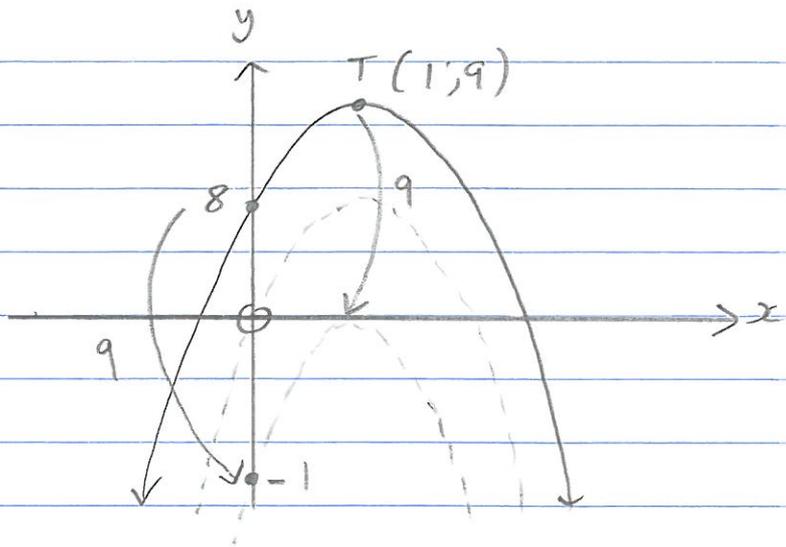
yint: $y = 8$

$-x^2 + 2x = k + 3$ $2 \neq + \quad \mathbb{R}$ roots

$-x^2 + 2x - k - 3 = 0$ $2 \neq + \quad \mathbb{R}$ roots

$-x^2 + 2x \underbrace{- k - 3}_{\text{yint}} = y$ $2 \neq + \quad \mathbb{R}$ x ints

$\therefore \quad \uparrow \downarrow$

$-1 < \text{yint} < 0$

$-1 < -k - 3 < 0$

$2 < -k < 3$

$-2 > k > -3$

6