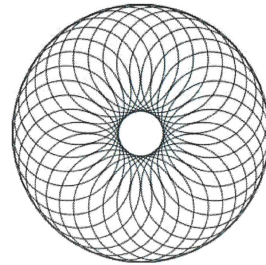


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**A LEVEL MATHS
YEAR 1 PURE**



ANSWERS

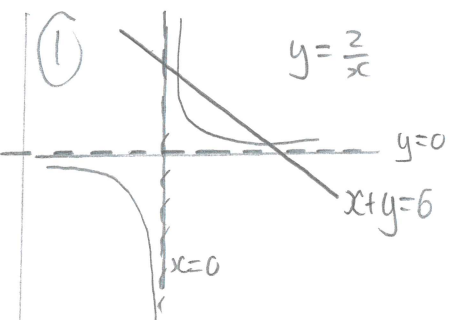
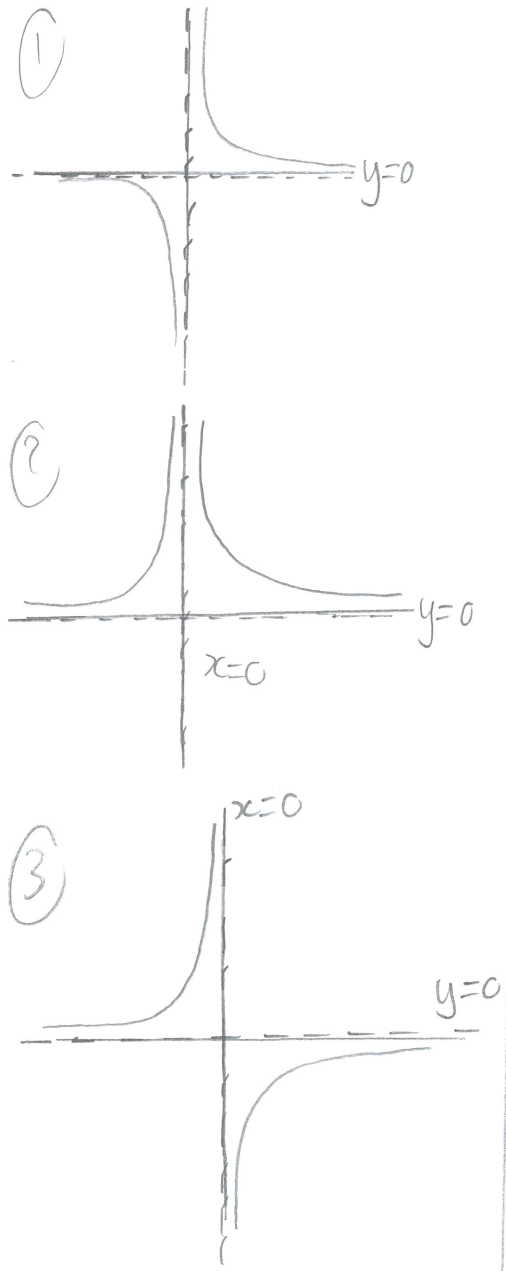
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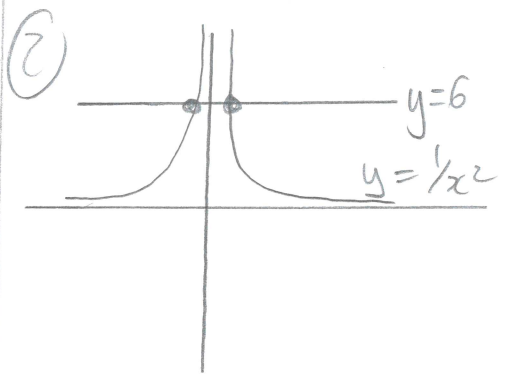
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OR SOLD ON FOR PROFIT. SCHOOLS CAN USE THEM ON THEIR VLE.**

<p>(1) Indices (2) Expanding Brackets (3) Factorising Expressions (4) More Indices (Negative and Fractional) (5) Working with Surds (6) Solving Quadratic Equations (7) Completing the Square for Quadratics Expressions (8) Function Notation (9) Sketching Quadratic Graphs (10) The Discriminant for Quadratic Equations (11) Applications of Quadratics Equations (12) Solving Linear Simultaneous Equations (13) Linear & Non-Linear Simultaneous Equations (14) Graphing Simultaneous Equations (15) Linear Inequalities (16) Quadratic Inequalities (17) Graphing Inequalities (18) Shading Inequalities (19) Cubic Graphs (20) Quartic Graphs (21) Reciprocal Graphs (22) The Intersection of Graphs (23) Transforming Graphs (Translations) (24) Transforming Graphs (Stretching/Reflecting) (25) Straight Line Graphs in the form $y = mx + c$ (26) More Straight Line Graphs (27) Straight Line Graphs (Parallel & Perpendicular) (28) The Geometry of Straight Lines (29) The Application of Linear Graphs (30) Circle Geometry Midpoint & Perpendicular</p>	<p>(31) The Equation of a Circle (32) Circles and Straight Lines (Intersections) (33) Circles (Tangents and Chords) (34) Circles and Triangles (35) Algebraic Fractions (36) Polynomial Division (37) The Factor and Remainder Theorem (38) An Introduction to Mathematical Proof (39) Methods of Proof (40) Binomial Expansion (Using Pascal's Triangle) (41) Binomial Expansion (Factorial Notation) (42) Binomial Expansion (The $\binom{n}{r}$ Method) (43) Binomial Expansion (Problem Solving) (44) Binomial Expansion (Estimations and Approximations) (45) The Cosine Rule (46) The Sine Rule (47) Areas of a Triangles (48) Triangles (Problem Solving) (49) Sine, Cosine & Tangent Graphs (50) Transforming Graphs (Trigonometry) (51) The 'CAST' Diagram for Trig Ratios (52) Trigonometry (Exact Values) (53) Proving Trigonometric Identities (54) Solving Basic Trigonometric Equations (55) More Challenging Trigonometric Equations (56) Using Identities to Solve Trig Equations (57) Vectors (Introduction)</p>	<p>(58) Vector Notation (Column and i and j form) (59) Vectors (Magnitude and Direction) (60) Vectors (Position and Direction Vectors) (61) Vector Geometry (62) Application of Vectors (63) Differentiation (Gradients of Curves) (64) Differentiation from 1st Principles (65) Differentiating x^n (Basic Powers of) (66) Differentiation (Quadratic Expression) (67) Differentiation (Multiple Terms) (68) Differentiation (Gradients, Tangents and Normals) (69) Differentiation (Increasing and Decreasing Functions) (70) Differentiation (Stationary Points) (71) Differentiation (Gradient Functions) (72) The Applications of Differentiation (73) Integration (Basic Expressions (x^n)) (74) Indefinite Integrals (75) Integration (Finding c and Finding Functions) (76) Integration (Definite Integrals) (77) Integration (Basic Areas Under Curves) (78) Integration ('Negative and Positive Areas') (79) Integration (Areas between Curves and Lines) (80) Basic Exponential Functions (81) 'The' Exponential Function $y = e^x$ (82) Applications of Basic Exponential Models (83) Logarithms (Simplifying & Evaluating) (84) Logarithms (The Log Laws) (85) Logarithms (Log and Exponential Equations)</p>
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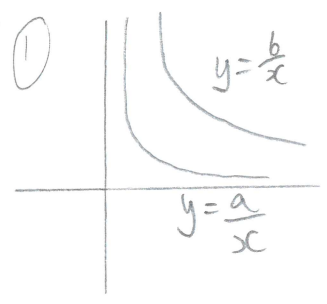
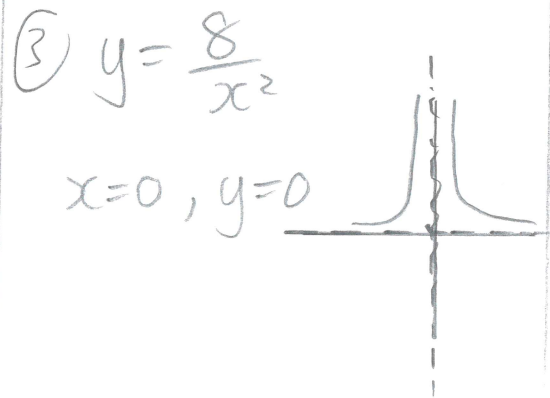
Pure (21) Reciprocal
Graphs



⑥ 2 as 2 points of intersection



2 solutions as 2 points of intersection.

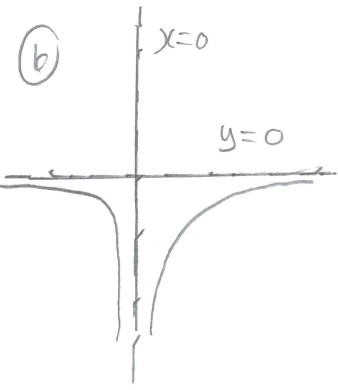


② @ sub in

$$-16 = \frac{a}{(-2)^2}$$

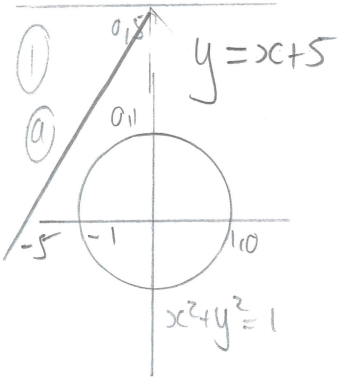
$$-16 = \frac{a}{4}$$

$$a = -64$$

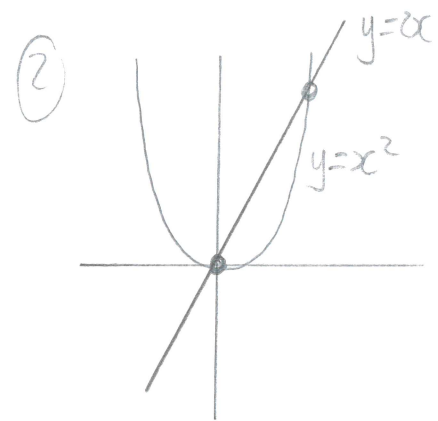


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22 Points of Intersection

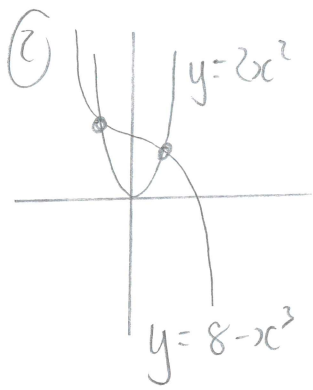


⑥ None!

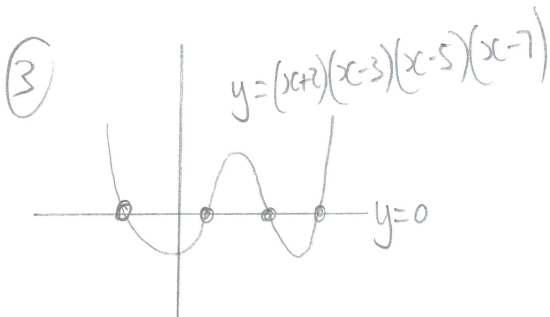


2 solutions as 2 points of intersection

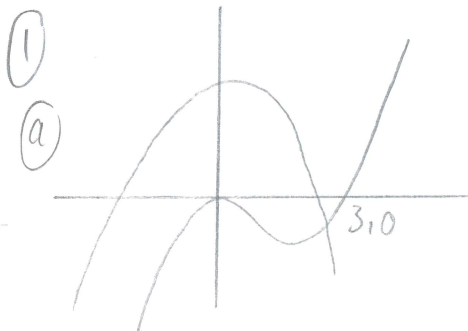
① Only 3 points of intersection and the cubic won't turn again. \therefore 3 roots and not 4.



2 Solutions

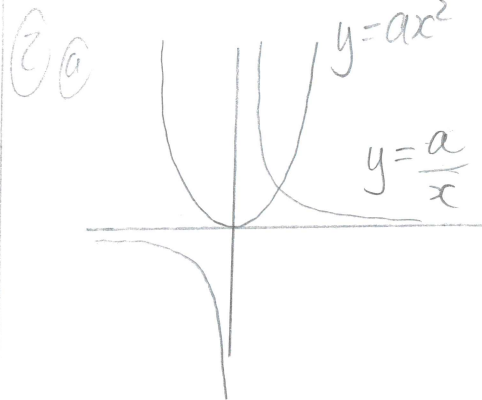


4 roots to $y = 0 \therefore$
4 Solutions



⑥ If $x^3 - 3x^2 = 8 - 3x^2$
then $x^3 = 8$
only real solution is $x = 2$, No further points

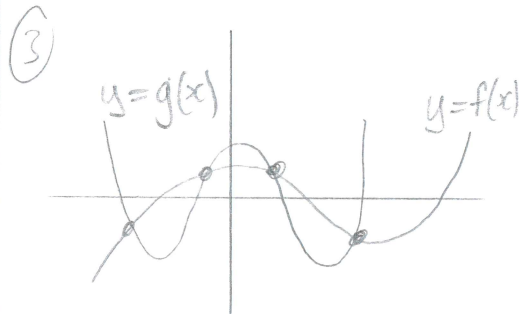
of intersection



⑥

$$\begin{aligned} y &= ax^2 \\ y &= \frac{a}{x} \end{aligned} \Rightarrow \begin{aligned} ax^2 &= \frac{a}{x} \\ x^2 &= \frac{1}{x} \\ x^3 &= 1 \\ x &= 1 \end{aligned}$$

$\therefore (1, a)$

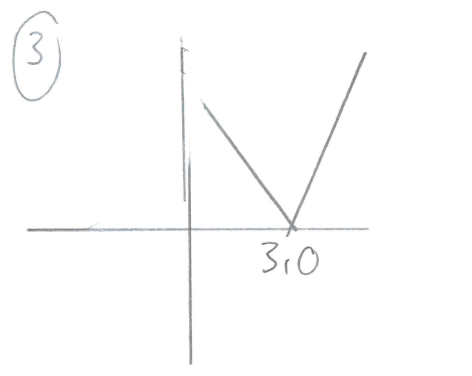
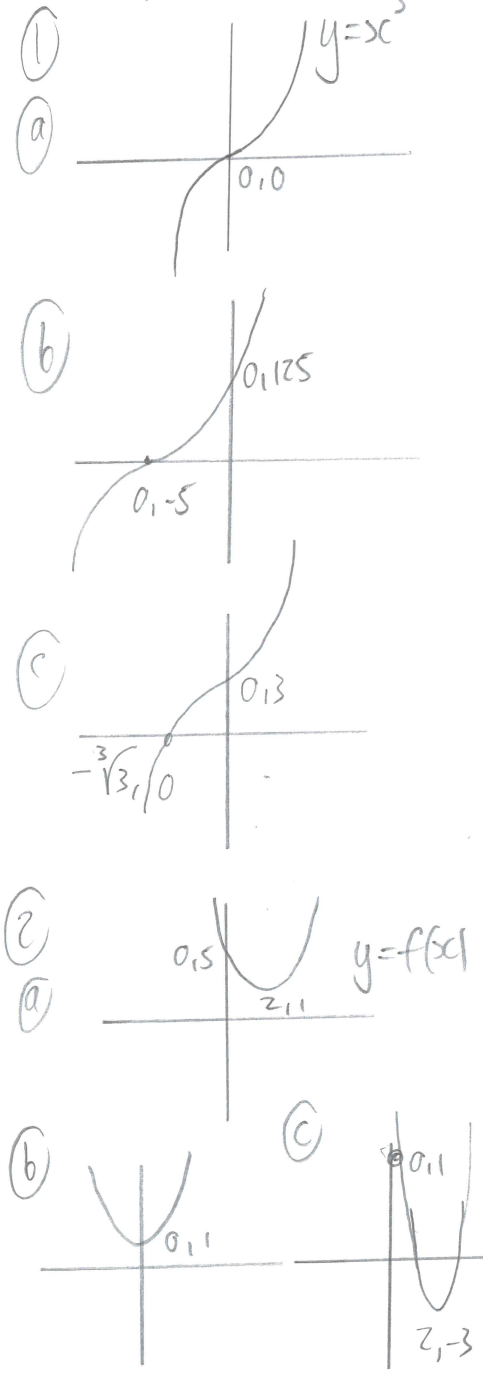


Max number of points of intersection of the two graphs is 4

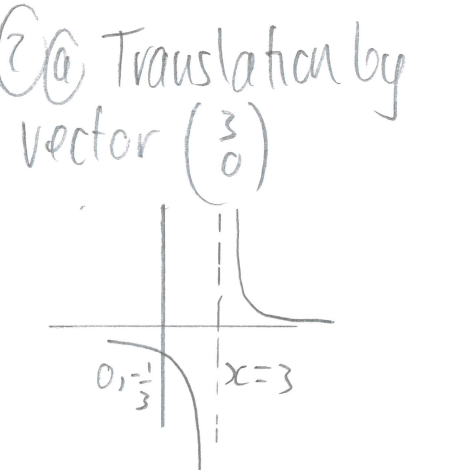
QV
Max number of roots of $ax^4 + bx^3 + cx^2 + dx + e = 0$ is 4 \therefore $g(x) + f(x)$ is still a quartic with a maximum of 4 roots.

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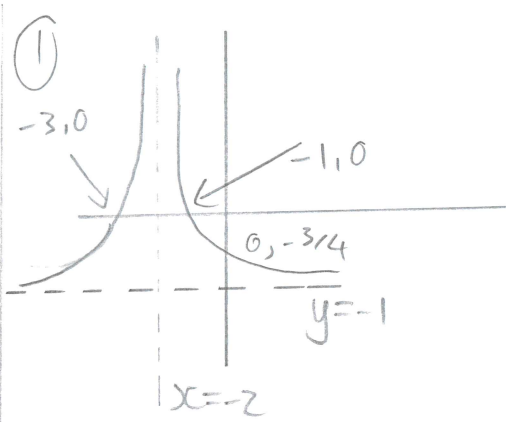
Pure (23) Translating Graphs



① Translation by the vector $\begin{pmatrix} 3 \\ 3 \end{pmatrix}$ or translated 3 units in the +x direction and 3 units in the +y direction.



③ $y = (x-3)^2 + 4$
 $y = x^2 - 6x + 9 + 4$
 $y = x^2 - 6x + 13$

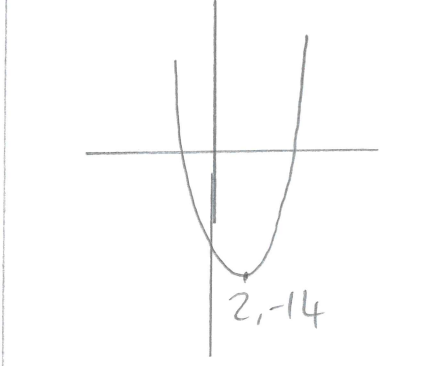


When $y = 0$
 $\frac{1}{(x+2)^2} - 1 = 0$
 $\therefore 1 = (x+2)^2$
 $\pm 1 = x+2$
 $x = -3$ or $x = -1$

When $x = 0$
 $y = \frac{1}{2^2} - 1$
 $= -\frac{3}{4}$

② Translation by the vector $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ or translation 3 units in the +x direction

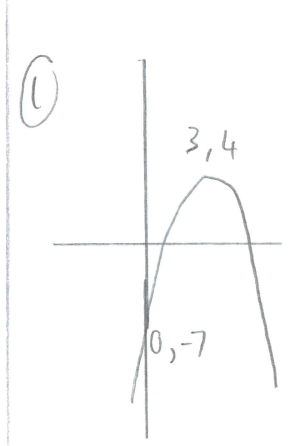
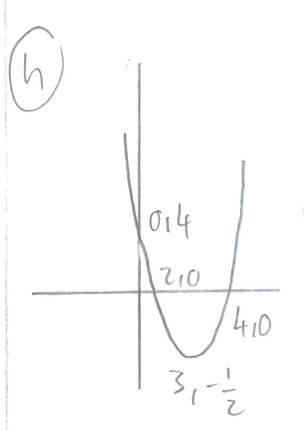
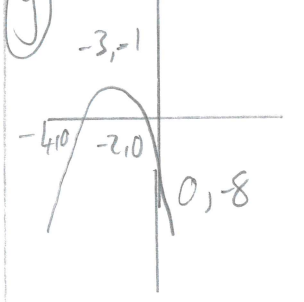
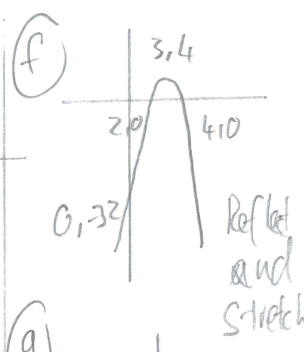
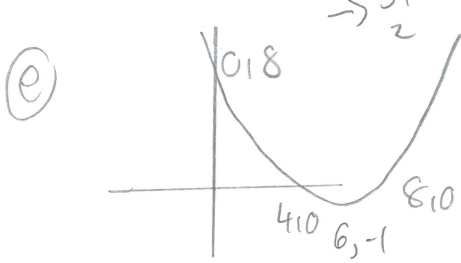
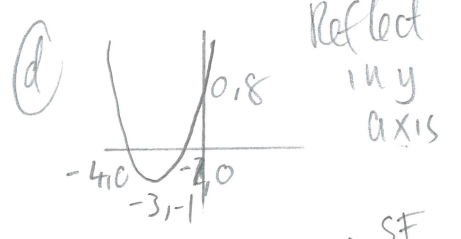
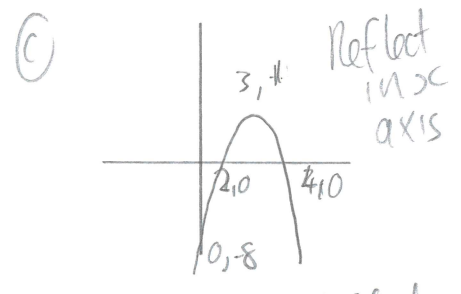
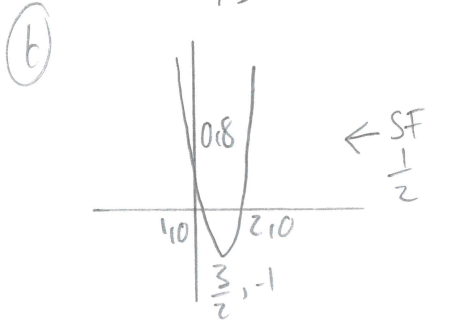
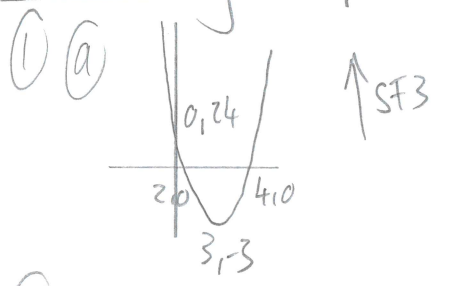
③ $y = x^2 - 4x - 10$
 $y = (x-2)^2 - 4 - 10$
 $y = (x-2)^2 - 14$



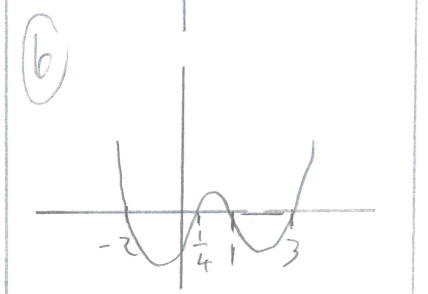
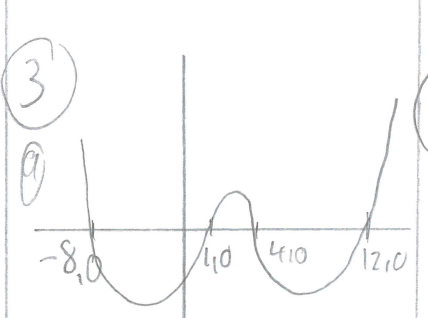
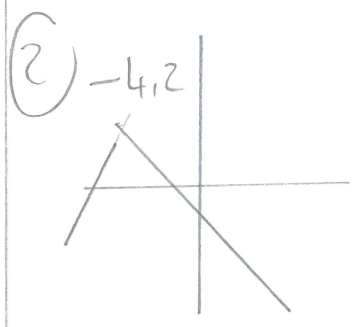
$\therefore a > 14$

Year 1 Pure
 Answers
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Stretching Graphs



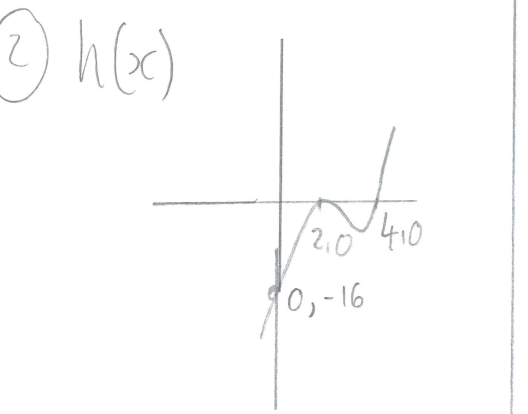
(1) Translation by the vector $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$ and stretch by a scale factor of 5 in the +y direction (order doesn't matter).



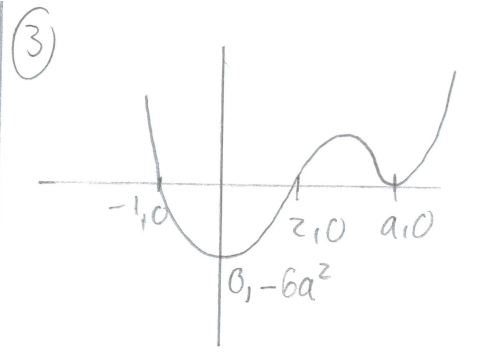
Divide x coordinates by 4

(1) $f(x) = (x-3)^2$
 $g(x) = 4[x^2 - 3x] + 9$
 $= 4\left[\left(x - \frac{3}{2}\right)^2 - \frac{9}{4}\right] + 9$
 $= 4\left(x - \frac{3}{2}\right)^2 - 9 + 9$
 $= 4\left(x - \frac{3}{2}\right)^2$

\therefore Stretch SF 4 in the +y direction and translation by the vector $\begin{pmatrix} \frac{3}{2} \\ 0 \end{pmatrix}$



$\therefore -16$ goes to 24
 $\therefore k = -\frac{3}{2}$

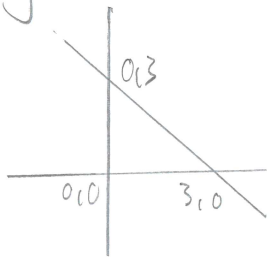


Pure (25) $y = mx + c$

① $m = \frac{y_1 - y_2}{x_1 - x_2}$

$\therefore m = \frac{10 - 8}{4 - 1} = \frac{2}{3}$

② $y = 3x + 2$



③ $6x + 4y = 3$
 $4y = -6x + 3$
 $y = -\frac{6}{4}x + \frac{3}{4}$
 $y = -\frac{3}{2}x + \frac{3}{4}$

$\therefore m = -\frac{3}{2}$

① $\frac{p - 4}{-6 - 2} = -\frac{9}{8}$

$\therefore p = 5$

② $y + 4 = -\frac{9}{8}(x - 2)$

$y = -\frac{9}{8}x + \frac{9}{4} - 4$

$y = -\frac{9}{8}x - \frac{7}{4}$

When $x = 0$, $y = -\frac{7}{4}$

$\therefore (0, -\frac{7}{4})$

When $y = 0$

$x = -\frac{14}{9}$

$\therefore (-\frac{14}{9}, 0)$

② $y - 2 = \frac{3}{5}(x - 8)$

③ $5y - 10 = 3x - 24$

$14 = 3x - 5y$

④ $14 = 3(0) - 5q$
 $14 = -5q$

$-\frac{14}{5} = q$

⑤ $ax + 10y - 2 = 0$

$10y = -ax + 2$

$y = -\frac{a}{10}x + \frac{1}{5}$

$\therefore \frac{a}{10} = \frac{4}{7}$

$a = \frac{40}{7}$

① $10a - 40 = 0$
 $a = 4$

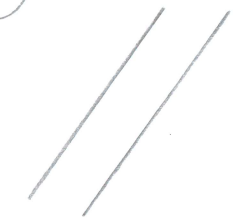
$4x + by - 40 = 0$

$0 + 20b - 40 = 0$

$b = 2$

② $x \geq \frac{c}{a}$

③ $m_1 = m_2$ as $||$



$ax + by + c = 0$

$by = -ax - c$

$y = -\frac{a}{b}x - \frac{c}{b}$

and $y = px + q$

$\therefore p = -\frac{a}{b}$

$bp = -a$

$a + bp = 0$

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