

NAME _____ INDEX NUMBER _____

SCHOOL _____ DATE _____

QUADRATIC AND CUBIC GRAPHS

| <i>KCSE 1989 - 2012 Form 3 Mathematics</i> | Working Space | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>1. 1989 Q22 P1</p> <p>(a) Using the grid provided below draw the graph of $y = -2x^2 + x + 8$ for values of x between -3 and 4 (4marks)</p> <p>(b) From your graphs find the roots of $-2x^2 + x + 8 = 0$ (1mark)</p> <p>(c) By drawing a suitable straight line graph on the same axes, find the roots of $-x^2 + 4x + 12 = 0$ (3marks)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>2. 1991 Q19 P2</p> <p>Complete the table given below for the equation $y = 5 + 3x - 2x^2$ by filling in the blank spaces.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 2px 10px;">x</th> <th style="padding: 2px 10px;">y</th> </tr> </thead> <tbody> <tr><td style="padding: 2px 10px;">-2</td><td style="padding: 2px 10px;">-9</td></tr> <tr><td style="padding: 2px 10px;">-1.5</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">-1</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">-0.5</td><td style="padding: 2px 10px;">3</td></tr> <tr><td style="padding: 2px 10px;">0</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">0.5</td><td style="padding: 2px 10px;">6</td></tr> <tr><td style="padding: 2px 10px;">1</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">1.5</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">2</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">2.5</td><td style="padding: 2px 10px;"></td></tr> <tr><td style="padding: 2px 10px;">3</td><td style="padding: 2px 10px;">-4</td></tr> <tr><td style="padding: 2px 10px;">3.5</td><td style="padding: 2px 10px;"></td></tr> </tbody> </table> <p>Use the values from the table above to draw the graph of $y = 5 + 3x - 2x^2$</p> <p>Use your graph to determine the ranges of values of x which satisfy the inequality $5 + 3x - 2x^2 \leq -2$</p> | x | y | -2 | -9 | -1.5 | | -1 | | -0.5 | 3 | 0 | | 0.5 | 6 | 1 | | 1.5 | | 2 | | 2.5 | | 3 | -4 | 3.5 | | |
| x | y | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -2 | -9 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -1.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -0.5 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.5 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | -4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | |
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| | (3marks) | |
| 3. | <p>1992 Q19 P1</p> <p>On the grid provided, draw the graph of $y = 2x^2 - 3x - 5$ for $-2 < x < 3$. (4marks)</p> <p>In order to solve graphically the equation $2x^2 - x - 3 = 0$, a straight line must be drawn to intersect the curve $y = 2x^2 - 3x - 5$.</p> <p>Obtain the equation of this straight line, draw the straight line and hence obtain the graphical solution to the equation $2x^2 - x - 3 = 0$</p> <p style="text-align: right;">(4 marks)</p> | |
| 4. | <p>1993 Q20 P1</p> <p>On the the grid provided, plot the graph of $y = -2x^2 + 3x + 6$ for values of x and y from $x = -3$ to $x = 4$. Use your graph to find the roots of the equation $-2x^2 + x + 9 = 0$</p> <p style="text-align: right;">(8 marks)</p> | |
| 5. | <p>1994 Q20 P1</p> <p>Draw the graph of the function $y = 2x^2 + 6x - 5$ by taking the integral values of x in $-4 \leq x \leq 3$. (4marks)</p> <p>Use the graph to solve the following equations.</p> <p>(i) $2x^2 + 6x - 5 = 0$ (4marks)</p> <p>(ii) $2x^2 - x - 6 = 0$</p> | |

| | | Working Space |
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| 6. | <p>1995 Q21 P1</p> <p>(a) Construct a table of values for the function $y = x^2 - 6$ for $-3 < x < 4$ (2 marks)</p> <p>(b) By drawing a suitable line on the same grid estimate the roots of the equation $x^2 + 2x - 2 = 0$ (3 marks)</p> | |
| 7. | <p>1997 Q20 P1</p> <p>(a) Draw the graph of $y = 6 + x - x^2$, taking integral value of x in $4 \leq x \leq 5$. (The grid is provided. Using the same axes draw the graph of $y = 2 - 2x$)</p> <p>(b) From your graphs, find the values of X which satisfy the simultaneous equations $y = 6 + x - x^2$ $y = 2 - 2x$</p> <p>(c) Write down and simplify a quadratic equation which is satisfied by the values of x where the two graphs intersect.</p> | |

Working Space

8. **1999 Q20 P1**
 (a) Complete the following table for the equation
 $y = x^3 - 5x^2 + 2x + 9$

| x | x^3 | $-5x^2$ | 2x | 9 | y |
|------|-------|---------|----|---|------|
| -2 | | -20 | -4 | 9 | |
| -1.5 | -3.4 | -11.3 | -3 | 9 | -8.7 |
| -1 | -1 | -5 | | 9 | |
| 0 | 0 | 0 | 0 | 9 | 9 |
| 1 | 1 | -1 | 2 | 9 | 7 |
| 2 | | -20 | 4 | 9 | |
| 3 | 27 | -45 | 6 | 9 | |
| 4 | 64 | | 8 | 9 | |
| 5 | 125 | | 10 | 9 | |

- (b) On the grid provided draw the graph of
 $y = x^3 - 5x^2 + 2x + 9$ for $-2 \leq x \leq 5$
- (c) Using the graph estimate the root of the equation
 $x^3 - 5x^2 + 2x + 9 = 0$ between $x = 2$ and $x = 3$
- (d) Using the same axes draw the graph of $y = 4 - 4x$
 and estimate a solution to the equation
 $x^2 - 5x^2 + 6x + 5 = 0$

9. **2000 Q19 P1**
 (a) Complete the table below for the equation
 $y = 2x^3 + 5x^2 - x - 6$ (2 marks)

| | | | | | | | |
|--------|------|-----|----|----|----|----|----|
| x | -4 | -3 | -2 | -1 | 0 | 1 | 2 |
| $2x^3$ | -128 | -54 | | | 0 | 2 | 16 |
| $5x^2$ | 80 | 45 | 20 | 5 | 0 | 5 | 20 |
| -x | 4 | 3 | | | | -1 | |
| -6 | -6 | -6 | -6 | -6 | -6 | -6 | -6 |
| y | -50 | | | | -6 | 0 | |

- (b) On the grid provided draw the graph
 $y = 2x^3 + 5x^2 - x - 6$ for $-4 \leq x \leq 2$. Use 2cm to represent 1
 unit on the x axis and 1cm to represent 5 units on the y
 axis (3 marks)

(c) By drawing a suitable line use the graph in (b) to solve the equation $2x^3 + 5x^2 - x - 4 = 0$ (3 marks)

Working Space

10 **2001 Q22 P1**
 (a) Complete the following table for the equation $y = x^3 + 2x^2$

| x | x^3 | $2x^2$ | y |
|------|--------|--------|-------|
| -3 | -27 | 18 | -9 |
| -2.5 | | | |
| -2 | -8 | 8 | 0 |
| -1.5 | -3.375 | 4.5 | 1.125 |
| -1 | -1 | 2 | 1 |
| -0.5 | 0.125 | 0.5 | 0.375 |
| 0 | 0 | 0 | 0 |
| 1 | 0.125 | 0.5 | 0.625 |
| 1.5 | 3.375 | 4.5 | 7.875 |

(b) On the grid provided draw the graph $y = x^3 + 2x^2$ for $-3 \leq x \leq 1.5$
 Take the scale: 2cm for 1 unit on the X- axis and 1 cm for 1 unit on y - axis

(c) By drawing a suitable line on the same grid,
 Estimate the roots of the equation: $x^3 + 2x^2 - x - 2 = 0$

11 **2003 Q22 P1**
 Complete the table below, for function $y = 2x^2 + 4x - 3$

| | | | | | | | |
|----------|----|----|-----|----|----|---|----|
| X | -4 | -3 | -2 | -1 | 0 | 1 | 2 |
| $2x^2$ | 32 | | 8 | 2 | 0 | 2 | |
| $4x - 3$ | | | -11 | | | | 5 |
| y | | | -3 | | -3 | 3 | 13 |

b) On the grid provided, draw the graph of the function $y = 2x^2 + 4x - 3$ for $-4 \leq x \leq 2$ and use the graph to estimate the roots of the equation $2x^2 + 4x - 3 = 0$ to 1 decimal place. (3 marks)

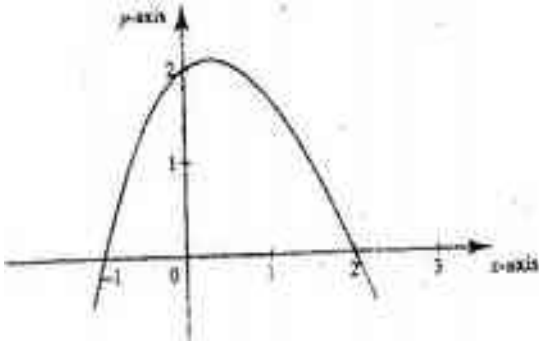
c) In order to solve graphically the equation $2x^2 + x - 5 = 0$, straight line must be drawn to intersect the curve $y = 2x^2 + 4x - 3$. Determine the equation of

| | <p>this straight line, draw the straight line hence obtain the roots of the equation $2x^2 + x - 5 = 0$ to 1 decimal place (3 marks)</p> | Working Space | | | | | | | | | | | | | | | | |
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| 12 | <p>2004 Q18 P1 The equation of a curve is given $y = x^3 + 4x^2 - 2$</p> <p>a) Determine the coordinates of the turning points of the curve, correct to 1 decimal place.</p> <p>b) Use the equation of the curve to complete the table below.</p> <table border="1" data-bbox="285 774 781 863"> <tr> <td>x</td> <td>-4</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> </tr> <tr> <td>y</td> <td>-2</td> <td></td> <td>6</td> <td>1</td> <td></td> <td></td> </tr> </table> <p>c)i) On the grid provided, use the solutions in part (a) and the values in the table in part (b) to draw the curve for $-4 < x < 1$.</p> <p>ii) Use the graph to solve the equation $x^3 + 4x^2 - 2 = 0$</p> | | x | -4 | -3 | -2 | -1 | 0 | 1 | y | -2 | | 6 | 1 | | | | |
| x | -4 | -3 | -2 | -1 | 0 | 1 | | | | | | | | | | | | |
| y | -2 | | 6 | 1 | | | | | | | | | | | | | | |
| 13 | <p>2006 Q14 P2 The table shows some corresponding values of x and y for the curve represented by $y = \frac{1}{4}x^3 - 2$</p> <table border="1" data-bbox="367 1396 678 1682"> <thead> <tr> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>-3</td> <td>-8.8</td> </tr> <tr> <td>-2</td> <td>-4</td> </tr> <tr> <td>-1</td> <td>-2.3</td> </tr> <tr> <td>0</td> <td>-2</td> </tr> <tr> <td>1</td> <td>-1.8</td> </tr> <tr> <td>2</td> <td>0</td> </tr> <tr> <td>3</td> <td>4.8</td> </tr> </tbody> </table> <p>On the grid provided below, draw the graph of $y = \frac{1}{4}x^3 - 2$ for $-3 \leq x \leq 3$. Use the graph to estimate the value of x when $y = 2$ (3 marks)</p> | X | Y | -3 | -8.8 | -2 | -4 | -1 | -2.3 | 0 | -2 | 1 | -1.8 | 2 | 0 | 3 | 4.8 | |
| X | Y | | | | | | | | | | | | | | | | | |
| -3 | -8.8 | | | | | | | | | | | | | | | | | |
| -2 | -4 | | | | | | | | | | | | | | | | | |
| -1 | -2.3 | | | | | | | | | | | | | | | | | |
| 0 | -2 | | | | | | | | | | | | | | | | | |
| 1 | -1.8 | | | | | | | | | | | | | | | | | |
| 2 | 0 | | | | | | | | | | | | | | | | | |
| 3 | 4.8 | | | | | | | | | | | | | | | | | |

Working Space

14 **2007 Q14 P2**

The figure below is a sketch of the graph of the quadratic function $y = k(x+1)(x-2)$



15 **2008 Q24 P2**

The table below shows values of x and some values of y for the curve $y = x^3 + 3x^2 - 4x - 12$ in the range $-4 \leq x \leq 2$.

a) Complete the table by filling in the missing values of y .

| x | y |
|------|-------|
| -4 | |
| -3.5 | -4.1 |
| -3 | |
| -2.5 | -1.1 |
| -2 | |
| -1.5 | -2.6 |
| -1 | |
| -0.5 | -9.4 |
| 0 | |
| 0.5 | -13.1 |
| 1 | |
| 1.5 | -7.9 |
| 2 | |

b) On the grid provided, draw the graph

$y=x^3 + 3x^2 - 4x - 12$ for $-4 \leq x \leq 2$.
 Use the scale. Horizontal axis 2cm for 1 unit and vertical axis 2cm for 5 units. (3 marks)

c) By drawing a suitable straight line on the same grid as the curve, solve the equation $x^3+3x^2-5x-6=0$ (5 marks)

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16 **2011 Q21 P2**
 The table below shows values of x and some values of y for the curve $y=x^3 + 2x^2 - 3x - 4$ for $-3 \leq x \leq 2$.

(a) Complete the table by filling in the missing values of y, correct to 1 decimal place. (2 marks)

| x | y |
|------|------|
| -3 | -4 |
| -2.5 | 0.4 |
| -2 | |
| -1.5 | 1.6 |
| -1 | 0 |
| -0.5 | |
| 0 | -4 |
| 0.5 | -4.9 |
| 1 | |
| 1.5 | |
| 2 | 6 |

(b) On the grid provided, draw the graph of $y=x^3 + 2x^2 - 3x - 4$. Use the scale: 1cm represents 0.5 units on x-axis
 1cm represents 1 unit on y- axis (3 marks)

(c) Use the graph to:

(i) Solve the equation $x^3 + 2x^2 - 3x - 4 = 0$; (3 marks)

(ii) Estimate the coordinates of the turn points of the curve (2 marks)

| | | |
|--|--|--|
| | | |
|--|--|--|