Pure 1 - Quadratics

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please complete all questions.

Expand and simplify

a $x(x^2 - x^{-1})$ **b** $2x^3(x^{-1} + 3)$ **c** $x^{-1}(3x - x^3)$ **d** $4x^{-2}(3x^5 + 2x^3)$

e $\frac{1}{2}x^2(6x + 4x^{-1})$ **f** $3x^{\frac{1}{2}}(x^{-\frac{1}{2}} - x^{\frac{3}{2}})$ **g** $x^{-\frac{3}{2}}(5x^2 + x^{\frac{7}{2}})$ **h** $x^{\frac{1}{3}}(3x^{\frac{5}{3}} - x^{-\frac{4}{3}})$

i $(x^2 + 1)(x^4 - 3)$ **j** $(2x^5 + x)(x^4 + 3)$ **k** $(x^2 - 2x^{-1})(x - x^{-2})$ **l** $(x^2 - x^{\frac{3}{2}})(x - x^{\frac{1}{2}})$

Evaluate

a 3^{-2} **b** $(\frac{2}{5})^0$ **c** $(-2)^{-6}$ **d** $(\frac{1}{6})^{-2}$ **e** $(1\frac{1}{2})^{-3}$ **f** $9^{\frac{1}{2}}$

g $16^{\frac{1}{4}}$ **h** $(-27)^{\frac{1}{3}}$ **i** $(\frac{1}{49})^{\frac{1}{2}}$ **j** $125^{\frac{1}{3}}$ **k** $(\frac{4}{9})^{\frac{1}{2}}$ **l** $36^{-\frac{1}{2}}$

m $81^{-\frac{1}{4}}$ **n** $(-64)^{-\frac{1}{3}}$ **o** $(\frac{1}{32})^{-\frac{1}{5}}$ **p** $(-\frac{8}{125})^{\frac{1}{3}}$ **q** $(2\frac{1}{4})^{\frac{1}{2}}$ **r** $(3\frac{3}{8})^{-\frac{1}{3}}$

Simplify

a $\sqrt{7} \times \sqrt{7}$ **b** $4\sqrt{5} \times \sqrt{5}$ **c** $(3\sqrt{3})^2$ **d** $(\sqrt{6})^4$

e $(\sqrt{2})^5$ **f** $(2\sqrt{3})^3$ **g** $\sqrt{2} \times \sqrt{8}$ **h** $2\sqrt{3} \times \sqrt{27}$

i $\frac{\sqrt{32}}{\sqrt{2}}$ **j** $\frac{\sqrt{3}}{\sqrt{12}}$ **k** $(\sqrt[3]{6})^3$ **l** $(3\sqrt[3]{2})^3$

Section 2 – Consolidation of this week's topic. Please complete all questions.

1. Using factorisation, solve each equation and then sketch the graph labelling all axes intercepts.

(a) $y = x^2 - 4x + 3$ (b) $y = x^2 + 4x - 5$ (c) $y = x^2 - 9$

(d) $y = x^2 - 2x$ (e) $y = 27 + 12x + x^2$ (f) $y = 60 - 4x - x^2$

(g) $y = 3x^2 + 11x - 4$ (h) $y = 2x^2 - 3x + 1$

(5 marks each)

2. Using completing the square, solve each equation and then sketch the graph labelling all axes intercepts and the turning point.

(a) $y = x^2 - 4x + 2$ (b) $y = 7 + 10x + x^2$ (c) $y = x^2 - 3x + 1$

(d) $y = 2x^2 - 4x + 1$ (e) $y = -x^2 + x + 1$ (f) $y = 2x^2 - 7x + 4$

(5 marks each)

3. Using the quadratic formula, solve each equation and then sketch the graph labelling all axes intercepts.

(a) $y = x^2 + 4x + 1$ (b) $y = 4 + 8x - x^2$ (c) $y = x^2 - 20x + 91$

(d) $y = 3x^2 - 7x + 5$

(5 marks each)

4. By evaluating the discriminant, determine whether the roots of each equation are real and distinct, real and equal or not real.

(a) $y = x^2 + 2x - 7$ (b) $y = x^2 + x + 3$ (c) $y = x^2 - 6x + 3$

(a) (d) $y = 2 + 3x + 2x^2$ (e) $y = 3x^2 - 7x + 5$

(2 marks each)

5. By choosing the most appropriate technique, solve each equation and then sketch the graph labelling all axes intercepts.

(a) $y = x^2 - 3x + 2$ (b) $y = x^2 + 5x + 6$ (c) $y = -x^2 + 5x - 4$

(d) $y = 3x^2 + 11x - 4$

(5 marks each)

(Total 130 Marks)

Section 3 – Extension questions. If you are aiming for a top grade, you should attempt these questions.

By completing the square, show that the roots of the equation $ax^2 + bx + c = 0$ are given by

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

Given that the x-axis is a tangent to the curve with the equation

$$y = x^2 + rx - 2x + 4,$$

find the two possible values of the constant r.