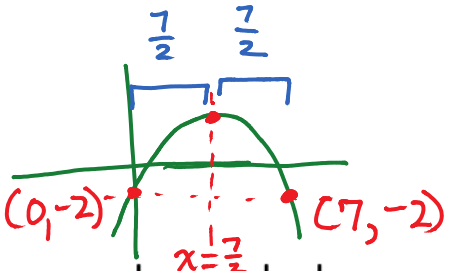
January 16, 2018 4:09 PM



UNIT 2 MCR 3UI Exam Review

1. Determine the maximum/minimum value and where it occurs by partial factoring and by completing the square. (Must use fractions for this – no decimals on exam)

$$y = -3x^2 + 21x - 2$$

PARTIAL FACTORING

$y = -3x(x-7) - 2$

Points $(0,-2), (7,-2)$

AofS $x = \frac{7}{2}$

$y = -3\left(\frac{7}{2}\right)\left(-\frac{7}{2}\right) - \frac{2}{1}$

$\frac{7}{2} - \frac{7}{1}$
$= \frac{7}{2} - \frac{14}{2}$
$= -\frac{7}{2}$

$y = \frac{147}{4} - \frac{8}{4}$

$y = \frac{139}{4}$

COMPLETING THE SQUARE

$y = -3\left(x^2 - 7x + \frac{49}{4} - \frac{49}{4}\right) - \frac{2}{1}$

$y = -3\left(x - \frac{7}{2}\right)^2 + \frac{147}{4} - \frac{8}{4}$

$y = -3\left(x - \frac{7}{2}\right)^2 + \frac{139}{4}$

$\therefore$ the maximum value of $\frac{139}{4}$ occurs at $x = \frac{7}{2}$.

NOT on formula sheet. $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $ax^2+bx+c=0$

2. Solve using the quadratic formula. (Simplified exact answers on exam... no decimals)

a) $12x = 8x^2 + 1$

$8x^2 - 12x + 1 = 0$

$x = \frac{12 \pm \sqrt{144-4(8)(1)}}{2(8)}$

$x = \frac{12 \pm \sqrt{144-32}}{16}$

$x = \frac{12 \pm \sqrt{112}}{16}$

$x = \frac{12 \pm \sqrt{16}\sqrt{7}}{16}$

$x = \frac{12 \pm 4\sqrt{7}}{16}$

$x = \frac{4(3 \pm \sqrt{7})}{16}$

$x = \frac{3 \pm \sqrt{7}}{4}$

(12)
$= 4 \times 28$
$= 4 \times 4 \times 7$
$= 16 \times 7$

$2^2 = 4$
9
16
25
36
49
⋮
144

$(20-1)^2 = 400-40+1$
$= 361$

$19^2 = (10+9)^2 = 100+180+81$
$= 361$

b) $5x^2 - 19x - 4 = 0$

$$x = \frac{19 \pm \sqrt{361-4(5)(-4)}}{10}$$

$$x = \frac{19 \pm \sqrt{441}}{10}$$

$$x = \frac{19 \pm 21}{10}$$

$$x = \frac{40}{10} \quad \text{OR} \quad x = \frac{-2}{10}$$

$$x = 4 \qquad x = -\frac{1}{5}$$

3. Solve by factoring.

a) $5x^2 + 13x - 6 = 0$

$1 \cdot 5 \quad 5 \;|\; 1 \quad -2$
$5 \quad 1 \;|\; 6 \quad 3$

diff 13

$(5x-2)(x+3)=0$

$5x-2=0$ OR $x+3=0$

$5x=2$ $\quad x=-3$

$x=\frac{2}{5}$

M - 30
A + 13
+15, -2

b) $4x^2 = 5x$

$4x^2-5x=0$

$(x)(4x-5)=0$

$x=0$ OR $4x-5=0$

$4x=5$

$x=\frac{5}{4}$

c) $9x^2 = 1$

$9x^2-1=0$

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

$3x-1=0$ OR $3x+1=0$

$3x=1$ $\quad x=-\frac{1}{3}$

$x=\frac{1}{3}$

4. Simplify. Ensure all denominators are rational numbers.

a) $24\sqrt{20} - 7\sqrt{45}$

$= 24\sqrt{4 \times 5} - 7\sqrt{9 \times 5}$

$= 24\sqrt{4}\sqrt{5} - 7\sqrt{9}\sqrt{5}$

$= 24(2)\sqrt{5} - 7(3)\sqrt{5}$

$= 48\sqrt{5} - 21\sqrt{5}$

$= 27\sqrt{5}$

b) $(3\sqrt{2})(5\sqrt{14})$

$= 15\sqrt{28}$

$= 15\sqrt{4 \times 7}$

$= 15(2)\sqrt{7}$

$= 30\sqrt{7}$

c) $\frac{10\sqrt{20}}{2\sqrt{5}}$

$= \frac{10}{2}\sqrt{\frac{20}{5}}$

$= 5\sqrt{4}$

$= 5(2)$

$= 10$

d) $\frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{4\sqrt{3}}{3}$

$7+\sqrt{3}, 7-\sqrt{3}$

5. Determine the family of parabolas with roots $7 \pm \sqrt{3}$

Sum $= (7+\sqrt{3})+(7-\sqrt{3})$

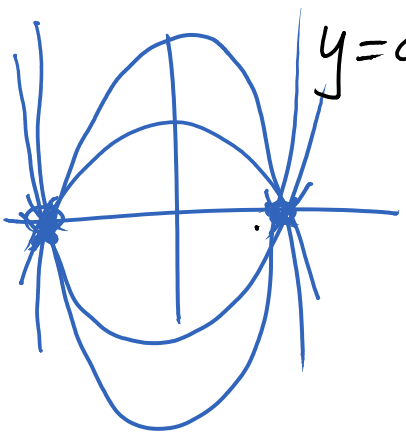
$= 14$

Product

$= (7+\sqrt{3})(7-\sqrt{3})$

$= 49-3$

$= 46$



$y = a(x-s)(x-t)$

$y = a(x^2 - Sx + P)$

$y = a(x^2 - 14x + 46)$

$y = x^2 - 2x - 15$

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

set $y=0$

$x-5=0$ $\quad x=5$

$x+3=0$ $\quad x=-3$

M -15

A -2

$-5, 3$

$S = 2$ $\quad P = -15$