K: $\overline{16}$ C: $\overline{10}$ A: $\overline{12}$

MCF 3M - Mr. Choi mr-choi.weebly.com Due: July 5, 2013

Assignment 2

1. Expand and simplify

a) $3m(2m+9)$ [K 1 mark]

$= 6m^2 + 27m$

b) $4(x+2)^2 - (x+2)(x-2)$ [K 4 marks]

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

$= 4(x^2+2x+2x+4) - (x^2-2x+2x-4)$

$= 4(x^2+4x+4) - (x^2-4)$

$= 4x^2 + 16x + 16 - x^2 + 4$

$= 4x^2 - x^2 + 16x + 16 + 4$

$= 3x^2 + 16x + 20$

2. Factor

a) $x^2 + 2x + 1$ [K 2 marks]

$1 \times 1 = 1$

Product	Sum
$(1)(1)$	$1+1=2$
$(-1)(-1)$	$(-1)+(-1)=-2$

$= x^2 + x + x + 1$

$= x(x+1) + 1(x+1)$

$= (x+1)(x+1)$

$= (x+1)^2$

b) $x^2 - x - 2$ [K: 2 marks]

$1 \times (-2) = -2$

Product	Sum
$(1)(-2)$	$1+(-2)=-1$
$(-1)(2)$	$(-1)+2=+1$

$= x^2 + x - 2x - 2$

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

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

c) $4m^2 - 28m + 40$ [K: 3 marks]

$1 \times 10 = 10$

Product	Sum
$(1)(10)$	$1+10=11$
$(-1)(-10)$	$(-1)+(-10)=-11$
$(2)(5)$	$2+5=7$
$(-2)(-5)$	$(-2)+(-5)=-7$

$= 4(m^2 - 7m + 10)$

$= 4(m^2 - 2m - 5m + 10)$

$= 4(m(m-2) - 5(m-2))$

$= 4(m-2)(m-5)$

d) $2a^2 + 12a + 16$ [K: 3 marks]

$1 \times 8 = 8$

Product	Sum
$(1)(8)$	$1+8=9$
$(-1)(-8)$	$(-1)+(-8)=-9$
$(2)(4)$	$2+4=6$
$(-2)(-4)$	$(-2)+(-4)=-6$

$= 2(a^2 + 6a + 8)$

$= 2(a^2 + 2a + 4a + 8)$

$= 2(a(a+2) + 4(a+2))$

$= 2(a+2)(a+4)$

3. Factor the expression further.

[1 mark] $(x^2+4)(x^2-4)$

* Remember that $(p^2x^2 - q^2) = (px+q)(px-q)$

p^2 $q^2=4$

$p=1$ $q=2$

$= (x^2+4)(x+2)(x-2)$

4. Consider the quadratic function

$$f(x) = -2(x-1)^2 - 3$$

a) In which form is this function? Does this parabola open upward or downward?

Vertex form. The parabola opens downward because the a-value is negative.

b) What are the coordinates of the vertex? Is the vertex a maximum or minimum?

$h=1$ which is a shift right 1 unit
$c=-3$ and shift down 3 units

so the vertex is at $(1,-3)$.
~~because~~ since the parabola opens downward the vertex is a maximum.

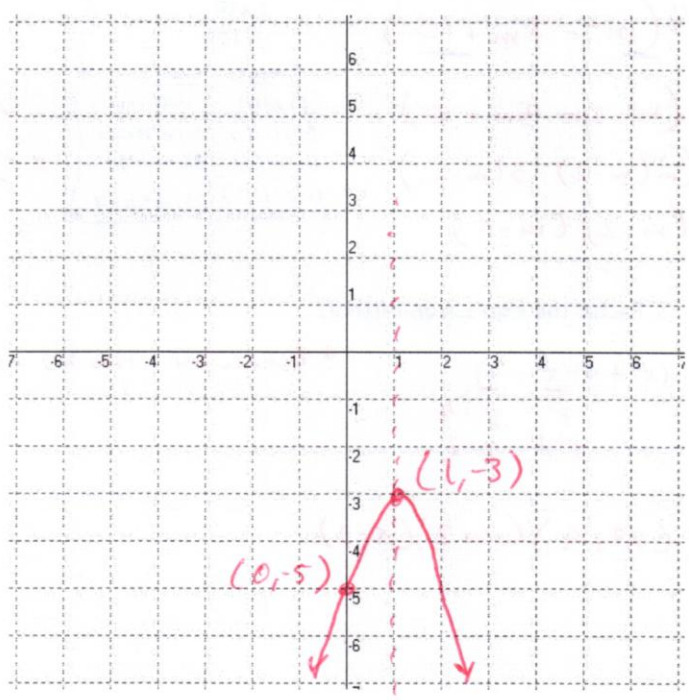
c) What is the axis of symmetry?

$x=1$

d) What is the y-intercept?

$f(0) = -2(0-1)^2 - 3$
$= -2(-1)^2 - 3$
$= -2 - 3$
$= -5$ $y=-5$ is the y-int

e) Graph the function



5) Digital music player cases sell for $20 each. Research by the seller has shown that for each $10 increase in price, 100 fewer cases will be sold. The revenue generated from case sales can be represented by the function

$$\boldsymbol{R(x) = (2 + x)(6 - x)}$$

where $\boldsymbol{R(x)}$ is the revenue, in thousands of dollars, and x is the number of $10 price increases.

a) What are the x-intercepts of this function? $R(x) = (2+x)(6-x)$

$2+x=0 \quad 6-x=0$

$x=-2 \quad x=6$

So the x-intercepts are $x=-2$, $x=6$

b) use the x-intercepts to find the coordinates of the vertex. *Remember the vertex is in the middle*

$X_{mid} = \frac{6+(-2)}{2} = \frac{6-2}{2} = \frac{4}{2} = 2$

$X_{mid} = 2$

So $R(2) = (2+2)(6-2)$
$= (4)(4)$
$= 16$ which is also y

So the vertex is at $(2, 16)$

c) Is the vertex a maximum or a minimum?

$R(x) = (2+x)(6-x)$
$= 12 - 2x + 6x - x^2$
$= -x^2 + 4x + 12$

a is negative so parabola opens down so the vertex is a maximum.

d) How many $10 price increases should there be in order to maximize revenue?

Vertex is maximum so since x represents the number of $10 increases, there should be 2 price increases.

e) What is the selling price that gives the maximum revenue?

Price is originally $20, but with 2 price increases of $10 the selling price that obtains maximum revenue is $40.

6) A javelin is thrown from a raised platform. Its height as a function of time is given by the equation:

$$h(t) = -5t^2 + 20t + 25$$

, where $h(t)$ is the height of the javelin, in metres, and t is the time, in seconds.

a) Write the equation in factored form.

$h(t) = -5t^2 + 20t + 25$

$= -5(1t^2 - 4t - 5)$

$= -5(t^2 + t - 5t - 5)$

$= -5(t(t+1) - 5(t+1))$

$= -5((t+1)(t-5))$

$1 \times (-5) = -5$

Products	Sum
$(1)(-5)$	$1 + (-5) = -4$
$(-1)(5)$	$(-1) + 5 = 4$

b) What is the hang time of the javelin?

Hang time of javelin means from $t = 0$ to the t-value of when javelin hits the ground. Javelin hitting the ground is when $h(t) = 0$.

$h(t) = 0 = -5(t+1)(t-5)$

Factored form helps us get the "zeros" or "roots"

$t + 1 = 0$ $\quad$ $t - 5 = 0$

$\cancel{t = -1}$ $\quad$ $t = 5$

we choose this one because the other t is negative which doesn't make sense (you can't have negative time).

the javelin is launched at $t = 0$ and Javelin hits ground after 5s...

~~and is so hang time~~

$\therefore$ The hang time of javelin is 5 seconds.