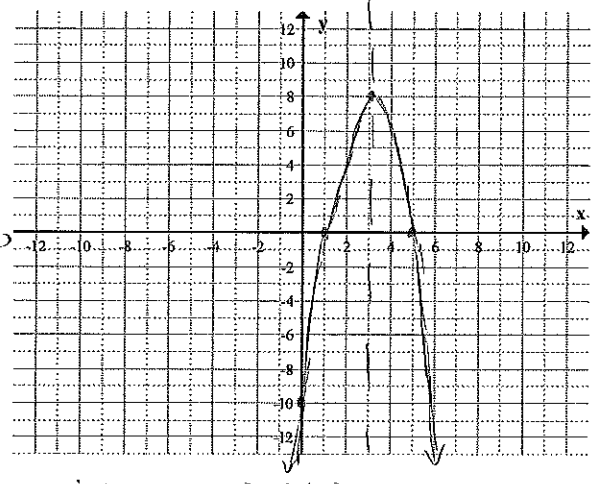
MAC1105 College Algebra
4.1 Practice Problems

1. For the function $g(x)=-2(x-3)^2+8$
   a. Find the vertex of the quadratic function.
   b. Determine if the parabola opens up or down.
   c. Determine the axis of symmetry.
   d. Find the x and y intercepts of the function.
   e. Graph the function.



a) $a(x-h)^2+k$
$-2(x-3)^2+8$
Vertex: (h,k)
$(3,8)$

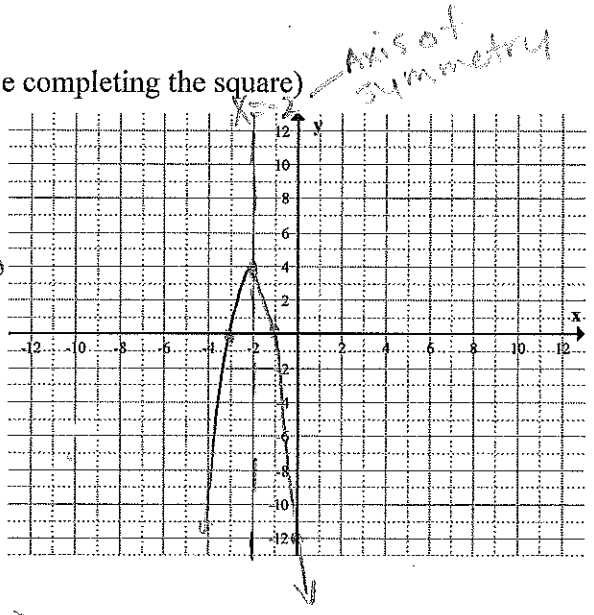
b) $a=-2<0$
down

c) axis of symmetry
$x=3$

d) x-int $y=0 \Rightarrow g(x)=0$
$0=-2(x-3)^2+8$
$-8 \quad -8$
$\frac{-8}{-2}=\frac{-2(x-3)^2}{-2}$
$4=(x-3)^2$
$\sqrt{4}=\sqrt{(x-3)^2}$
$\pm 2 = x-3$
$+3 \quad +3$
$3\pm 2 = x$
$5, 1 = x$
$(5,0)\ (1,0)$

y-int $x=0 \Rightarrow g(0)$
$g(0)=-2(0-3)^2+8$
$=-2(-3)^2+8$
$=-2(9)+8$
$=-18+8$
$=-10$
$(0,-10)$

2. For the function $f(x)=-4x^2-16x-12$
   a. Find the vertex of the quadratic function. (Use completing the square)
   b. Determine if the parabola opens up or down.
   c. Determine the axis of symmetry.
   d. Find the x and y intercepts of the function.
   e. Graph the function.



a) $f(x)=-4x^2-16x-12$
$=-4(x^2+4x\ )-12$
$=-4(x^2+4x+\underline{4})-12+\underline{16}$
$=-4(x+2)^2+4$
vertex $(-2,4)$

b) $a=-4<0$
opens down

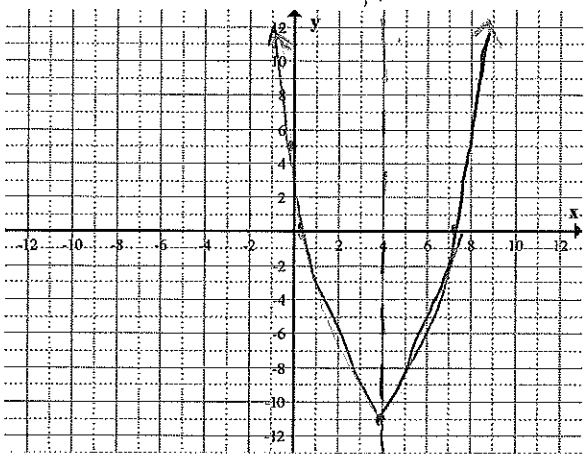
c) axis of symmetry
$x=-2$

d) x-int $y=0 \Rightarrow f(x)=0$
$0=-4x^2-16x-12$
$0=-4(x^2+4x+3)$
$0=-4(x+3)(x+1)$
$0=x+3 \quad x+1=0$
$x=-3 \quad x=-1$
$(-3,0) \quad (-1,0)$

y-int $x=0 \Rightarrow f(0)$
$f(0)=-4(0)^2-16(0)-12$
$=-12$
$(0,-12)$

3. For the function $f(x)=x^2-8x+5$
   a. Find the vertex of the quadratic function.
   b. Determine if the parabola opens up or down.
   c. Determine the axis of symmetry.
   d. Find the x and y intercepts of the function.
   e. Graph the function.

Axis of symmetry $x=4$



(a) vertex formula

$h=\frac{-b}{2a}$

$=\frac{-(-8)}{2(1)}$

$=\frac{8}{2}$

$=4$

$k=f(4)$

$=4^2-8(4)+5$

$=16-32+5$

$=-16+5$

$=-11$

$(4,-11)$

(b) $a=1>0$ opens up

(c) $x=4$ Axis of symmetry

(d) y-int $x=0$ $f(0)$

$f(0)=0^2-8(0)+5$

$=5$

$(0,5)$

x-int $y=0 \Rightarrow f(x)=0$

$0=x^2-8x+5$

$x=\frac{-(-8)\pm\sqrt{(-8)^2-4(1)(5)}}{2}$

$=\frac{8\pm\sqrt{64-20}}{2}$

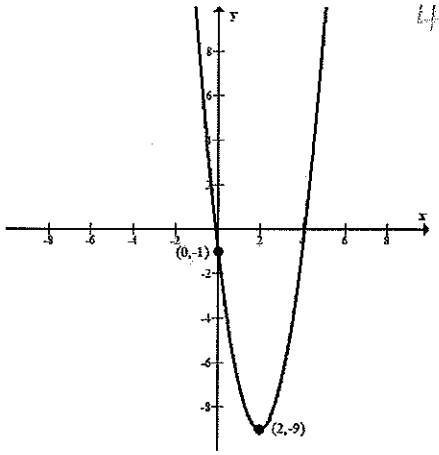
$=\frac{8\pm\sqrt{44}}{2}$

$=\frac{8\pm2\sqrt{11}}{2}=4\pm\sqrt{11}$

$4+\sqrt{11}\approx 7.3$

$4-\sqrt{11}\approx .68$

4. Analyze the graph of a quadratic function given its graph.
   a. Is the leading coefficient positive or negative? positive
   b. What is the value of h? What is the value of k? $h=2$; $K=-9$
   c. What is the value of the leading coefficient a?
   d. Write the equation in standard form.
   e. Write the equation in general form.



c) $y=a(x-h)^2+k$

$(h,k)=(2,-9)$

$(x,y)=(0,-1)$

$-1=a(0-2)^2+-9$

$-1=a(-2)^2-9$

$+9 \quad +9$

$\frac{8}{4}=\frac{a(4)}{4}$

$2=a$

d) $y=2(x-2)^2-9$

e) $y=2(x-2)(x-2)-9$

$=2(x^2-2x-2x+4)-9$

$=2(x^2-4x+4)-9$

$=2x^2-8x+8-9$

$=2x^2-8x-1$