Focus and Directrix to Vertex Form

Write an equation of the parabola given the focus and directrix: $y=a(x-h)^2+k$ (h,k)

	Focus	Directrix	Vertex	a	Vertex Form
1	(0,8)	y=-2 $2p=10$ $p=5$	(0,3)	$a=\frac{1}{4p}$ $a=\frac{1}{4(5)}$ $a=\frac{1}{20}$	$y=\frac{1}{20}(x-0)^2+3$ $y=\frac{1}{20}x^2+3$
2	(-3,2)	y=-4 $2p=6$ $p=3$	(-3,-1)	$a=\frac{1}{4p}$ $a=\frac{1}{4(3)}$ $a=\frac{1}{12}$	$y=\frac{1}{12}(x+3)^2-1$
3	(5,2)	y=8 $2p=6$ $p=3$	(5,5)	$a=\frac{1}{4p}$ $a=\frac{1}{4(3)}$ $a=-\frac{1}{12}$	$y=-\frac{1}{12}(x-5)^2+5$
4	(4,-7)	y=5 $2p=12$ $p=6$	(4,-1)	$a=\frac{1}{4(6)}$ $a=-\frac{1}{24}$	$y=-\frac{1}{24}(x-4)^2-1$
5	(-4,1)	y=-3 $4p=4$ $p=2$	(-4,-1)	$a=\frac{1}{4(2)}=\frac{1}{8}$	$y=\frac{1}{8}(x+4)^2-1$
6	(9,0)	y=-13 $2p=13$ $p=6.5$	(9,-6.5)	$a=\frac{1}{4(6.5)}$ $a=+\frac{1}{26}$	$y=\frac{1}{26}(x-9)^2-6.5$
7	(2,.25)	y=-1.75 $2p=2$ $p=1$	(2,-.75)	$a=\frac{1}{4(1)}=\frac{1}{4}$	$y=\frac{1}{4}(x-2)^2-.75$
8	(.5,3)	y=2.5 $2p=.5$ $p=.25$	(.5,2.75)	$a=\frac{1}{4(.25)}=1$	$y=1(x-.5)^2+2.75$
9	(-1,2)	y=-5 $2p=7$ $p=3.5$	(-1,-1.5)	$a=\frac{1}{4(3.5)}$ $a=\frac{1}{14}$	$y=\frac{1}{14}(x+1)^2-1.5$
10	(-.25,1)	y=1.25 $2p=\frac{1}{4}$ $p=\frac{1}{8}$	(-.25,1.125)	$a=\frac{-1}{4(\frac{1}{8})}=-2$	$y=-2(x+.25)^2+1.125$

Use the information provided to write the vertex form equation of each parabola.

1) Vertex at origin, Focus: $\left(0,-\frac{1}{32}\right)$ (0,0) Vertex (h,k)

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

$y=-8(x-0)^2+0$

$y=-8x^2$

$a=\frac{1}{4p}$

$a=\frac{1}{4(\frac{1}{32})}=\frac{1}{\frac{4}{32}}$

$\frac{1}{1}\div\frac{4}{32}=1\cdot\frac{32}{4}=8$

2) Vertex at origin, Focus: $\left(0,\frac{1}{8}\right)$ (0,0)

$y=2(x-0)^2+0$

$y=2x^2$

$a=\frac{1}{4p}=\frac{1}{4(\frac{1}{8})}=\frac{1}{\frac{4}{8}}$

$1\div\frac{4}{8}=1\cdot\frac{8}{4}=2$

3) Vertex at origin, Directrix: $y=\frac{1}{4}$ (0,0)

$y=-1(x-0)^2+0$

$y=-1x^2$

$a=\frac{1}{4p}$

$a=\frac{1}{4(\frac{1}{4})}=\frac{1}{\frac{4}{4}}=1$

4) Vertex at origin, Directrix: $y=-\frac{1}{8}$ (0,0)

$y=2(x-0)^2+0$

$y=2x^2$

$a=\frac{1}{4(\frac{1}{8})}=\frac{1}{\frac{4}{8}}$

$1\div\frac{4}{8}=1\cdot\frac{8}{4}=2$