(1)[5 points] Find the equation of the line through $(-2, 4)$ and perpendicular to $3x+y-5=0$.

$3x+y-5=0$

$y = -3x+5$ } slope $m=-3$

∴ slope of line through $(-2,4)$ is $\frac{-1}{-3} = \frac{1}{3}$

∴ equation is $\boxed{y-4 = \frac{1}{3}(x+2)}$

or $y = \frac{1}{3}x + \frac{2}{3} + 4$

$\boxed{y = \frac{1}{3}x + \frac{14}{3}}$

(2)[5 points] Find the points of intersection of the graphs of the linear functions $f(x) = 4x+7$ and $g(x) = \frac{1}{3}x + \frac{10}{3}$.

$4x+7 = \frac{1}{3}x + \frac{10}{3}$) multiplying through by 3

$12x+21 = x+10$

$11x = -11$

$x = -1$

∴ $y = f(-1) = 4(-1)+7 = 3$

∴ point of intersection is $(-1, 3)$

(3)[5 points] Put $f(x) = 4x^2 - 4x - 1$ into standard form, give the vertex and axis of symmetry, and sketch the graph of the function.

$$f(x) = 4x^2 - 4x - 1$$

$$= 4\left[x^2 - x - \tfrac{1}{4}\right]$$

$$= 4\left[(x - \tfrac{1}{2})^2 - \tfrac{1}{4} - \tfrac{1}{4}\right]$$

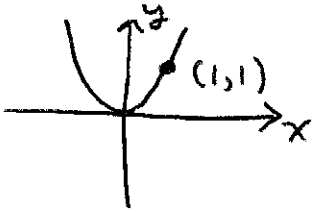
$$= 4(x - \tfrac{1}{2})^2 - 1 - 1$$

$$= 4(x - \tfrac{1}{2})^2 - 2$$

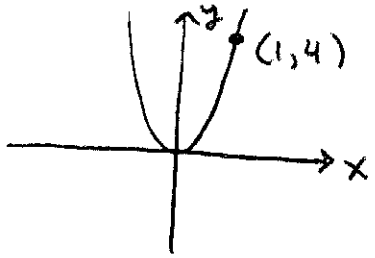
Vertex is $(\frac{1}{2}, -2)$

axis of symmetry is $x = \frac{1}{2}$

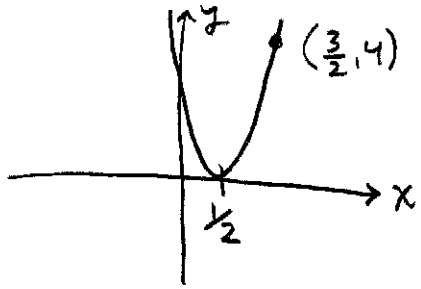
① $y = x^2$



② $y = 4x^2$



③ $y = 4(x - \frac{1}{2})^2$



④