answer

Given that: p(y|$x) = p(x|y)p(y)p(x)p(y=1|x;\phi,\mu_0,\mu_1,\Sigma) = p(x|y=1;\phi,\mu_0,\mu_1,\Sigma)p(y=1;\phi,\mu_0,\mu_1,\Sigma)p(x;\phi,\mu_0,\mu_1$
$p(x|y=1)p(y=1)p(x) = p(x|y=1)p(y=1)p(x|y=0)p(y=0) + p(x|y=1)p(y=1) = exp(-12(x-\mu_1)^T\Sigma^-1(x-\mu_1))($
$11 + 1 - \phi\phi exp(-12(x-\mu_0)^T\Sigma^-1(x-\mu_0) + 12(x-\mu_1)^T\Sigma^-1(x-\mu_1) = 11 + exp(-12((x-\mu_0)^T\Sigma^-1\mu_0 - \mu_1)^T\Sigma^-1\mu_1)$

rearranging terms (x - $\mu_0)^T\Sigma^-1(x-\mu_0) - (x-\mu_1)^T\Sigma^-1(x-\mu_1) = x^T\Sigma^-1x - \mu_0^T\Sigma^-1x - x^T\Sigma^-1\mu_0 +$
$\mu_0^T\Sigma^-1\mu_0 - x^T\Sigma^-1x + \mu_1^T\Sigma^-1x + x^T\Sigma^-1\mu_1 - \mu_1^T\Sigma^-1\mu_1 = -2\mu_0^T\Sigma^-1x + \mu_0^T\Sigma^-1\mu_0 + 2\mu_1^T\Sigma^-1c - \mu_1^T\Sigma^-1\mu_1 =$
$2(\mu_1-\mu_0)^T\Sigma^-1x+\mu_0^T\Sigma^-1\mu_0-\mu_1^T\Sigma^-1\mu_1 Therefore: p(y=1|x;\phi,\mu_0,\mu_1,\Sigma) == 11 + exp(log1-\phi phi + 12\mu_1^T\Sigma^-1\mu_1 - 12$
$\Sigma^-1(\mu_1-\mu_0)\theta_0 = 12(\mu_0^T\Sigma^-1\mu_0 - \mu_1^T\Sigma^-1\mu_1) - log1 - \phi\phi$