1. $\log 100 = \log 4 + \log 25$

   $= 2\log 2 + 2\log 5$

   $= \underline{2a + 2b}$

2. $\log_2 11 = x - 3$

   First write in base-index form

   $2^{x-3} = 11$

   $x - 3 \, \log 2 = \log 11$

   $x - 3 = \dfrac{\log 11}{\log 2}$

   $x - 3 = 3.46$

   $\underline{x = 6.46}$

3. (a) $3x(x-1) = 0$

   $3x = 0 \qquad (x-1) = 0$

   $\underline{x = 0} \qquad \underline{x = 1}$

   (b) $2x^2 = 18$

   $x^2 = 9$

   $\underline{x = \{-3, 3\}}$

4. (a) $\dfrac{x+3}{x^2 - 3^2}$

   $\dfrac{x+3}{(x-3)(x+3)}$

   $= \dfrac{1}{x-3}$

   (b) $\dfrac{4x}{y} - \dfrac{x}{3} \div \dfrac{y}{3}$

   $\dfrac{4x}{y} - \dfrac{x}{3} \times \dfrac{3}{y}$

   $\dfrac{4x}{y} - \dfrac{3x}{3y}$

   $= \dfrac{12x}{3y} - \dfrac{3x}{3y}$

   $= \dfrac{3x}{y}$

5. (a) discriminant $= b^2 - 4ac$

   $= (-6)^2 - 4(5)(10)$

   $= \underline{-164}$

   (b) No real roots

6. $f(x) = -x^3 - 3x^2 + bx + 5$

$f(-2) = -(-2)^3 - 3(-2)^2 + b(-2) + 5$

$-2 = 1 - 2b$

$\underline{1.5 \quad = b}$

7. $\qquad Y = \dfrac{mT}{q + mn}$

$Y(q + mn) = mt$

$Yq + Ymn = mt$

$\qquad Yq = mt - Ymn$

$\qquad Yq = m(t - Yn)$

$\qquad \dfrac{Yq}{t - Yn} = m$

8. (a) $2x^2 - 5x - 4 = 0$

$\qquad a = 2,\ b = -5,\ c = -4$

$\qquad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2ax} = \dfrac{--5 \pm \sqrt{(-5)^2 - 4(2)(-4)}}{2(2)} = \dfrac{5 \pm \sqrt{57}}{4} = \underline{\{3.13,\ -0.64\}}$

(b) $3x^2 + 9 = 20x$

First rearrange into the form $ax^2 + bx + c = 0$

$3x^2 - 20x + 9 = 0$

$a = 3,\ b = -20,\ c = 9$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2ax} = \dfrac{--20 \pm \sqrt{(-20)^2 - 4(3)(9)}}{2(3)} = \dfrac{20 \pm \sqrt{292}}{6} = \underline{\{6.18,\ 0.48\}}$