1a. $\frac{x^3}{x+4} = \frac{x^3}{x^5} = x^{-2}$

b. $(x^2)^{-3} = x^{-6}$

c. $\left(\frac{27}{y^3}\right)^{\frac{1}{3}} = \frac{27^{\frac{1}{3}}}{y^{\frac{3}{3}}} = \frac{3}{y}$

2a. $4x + 3 = 8x - 6$

$-8x \quad -8x$

$-4x + 3 = -6$

$-3 \quad -3$

$-4x = -9$

$\frac{-4x}{-4} = \frac{-9}{-4}$

$x = \frac{9}{4}$

b. $\frac{x}{2} + \frac{x}{4} = \frac{2}{8}$

$= \frac{1}{4}$

$\times 4 \quad \times 4$

$2x + x = 1$

$\frac{3x}{3} = \frac{1}{3}$

$x = \frac{1}{3}$

3 $t^2 - 5t + 4 = 0$

gold

$2, 2 = 4$

$-2, -2 = 4$

$-1, -4 = 5$ ✓

$= (t-1)(t-4)$

$x = 1$ or $x = 4$

4. $2w^2 = 6w + 2$

$2w^2 - 6w - 2 = 0$

$a = 2$

$b = -6$

$c = -2$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = w = \frac{6 \pm \sqrt{-6^2 - 4 \times (-2 \times 2)}}{2 \times 2}$

$= \frac{6 \pm \sqrt{36 + 16}}{4} = \frac{6 \pm \sqrt{84}}{4}$

$w = \frac{6 + \sqrt{84}}{4}$ or $w = \frac{6 - \sqrt{84}}{4}$

5. $3w^2 - 4w + 5 = 0$

$a = 3$

$b = -4$

$c = 5$

$a(x+d)^2 + e = 0$

$d = \frac{b}{2a} \qquad e = c - \frac{b^2}{4a}$

$d = \frac{-4}{6} \qquad e = 5 - \frac{-4^2}{4 \times 3}$

$3\left(w + \frac{-4}{6}\right)^2 + \left(5 - \frac{16}{9}\right) = 0$

$w = \frac{2}{3} \pm i\sqrt{\frac{29}{9}}$

6. $x(s) = \frac{s+1}{s^2-16}$ poles = vertical asymptote at $x = 4$ and $x = -4$

$\frac{s+1}{(s+4)(s-4)}$

7. $\frac{2x^3-2x^2+3x+3}{x^2+1} \rightarrow 2x-2+\frac{x+5}{x^2+1}$

Oblique asymptote at $y = 2x-2$

8. $I(x) = \frac{2x}{3} + \frac{5}{q} - \frac{1}{q(3x+2)}$ LCM of $3, q, q(3x+2) = q(3x+2)$

$= \frac{6x(3x+2)}{q(3x+2)} + \frac{5(3x+2)}{q(3x+2)} - \frac{1}{q(3x+2)}$

$= \frac{6x(3x+2)+5(3x+2)-1}{q(3x+2)}$

$= \frac{q(x+1)(2x+1)}{q(3x+2)}$

$= \frac{(x+1)(2x+1)}{3x+2}$

	x	1
2x	$2x^2$	2x
1	x	1

$= \frac{2x^2+3x+1}{3x+2}$

8.

Asymptotes pole at $x = -\frac{2}{3}$

oblique at $\frac{2x}{3} + \frac{5}{q}$

no horiz asymptotes

9.
a $\log_6 36 = 2$
b $\log_4 12 = \log_4 3 + \log_4 4 = 1 + \log_4 3 \simeq 1.79248\ldots$
c $\log_9 82 \simeq 2.00558\ldots$
d $\log_{10} 1000 = 3$

10.
a. $2\log y + 4\log x = \log(y^2 x^4)$
b. $\log x + (\log y - \log z) = \log\left(\frac{xy}{z}\right)$
c. $\ln(xy) + \ln(y^2) = \ln(xy^3)$
d $\frac{\ln x}{\ln 10}$

11. a. $e^x = 1$ $x = 0$

b. $e^{3x-1} = 2$ $x = \frac{1}{3}$

c. $\sqrt{e^{3x}} = 1$ $x = 1$

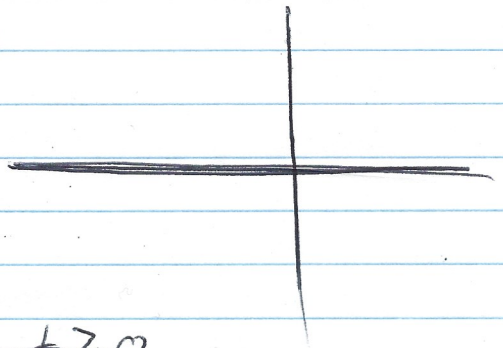
d. ~~$2\ln(t) = 4$~~ $e^x(1-e^x) = -6$ $x = \ln(3)$

e. $2\ln t = 4$ $t = e^2$

f. $\log_{10}(t^3) = 2$ $t = 10^{\frac{2}{3}} = \sqrt[3]{10^2}$

g. $\ln(t-3) = 1$ $t = e+3$

12. $2u(t) - 3u(t+2)$



13. ramp ft $\begin{cases} 3t-2, & t \geq 0 \\ 0, & t < 0 \end{cases}$

$f(t-1)$

$3(t-1)-2 =$