GATEWAY 3 PREP

Problem 1. Find the x values for which the given curves intersect:

a) $y = x^2 - 1$ and $y = 2x - 2$
b) $y = \frac{2}{x} - x$ and $y = 3 - 2x$
c) $y = \sqrt{x}$ and $y = x$
d) $y = \sqrt{3 - x}$ and $y = \sqrt{x^2 + 1}$
e) $y = x + 1$ and $y = \sqrt{2x + 10}$

Problem 2. Factor completely:

a) $1 - 16x^4 = \dots$
b) $16x^4 - 20x^2 + 4 = \dots$

Problem 3. Express the following monster expressions in terms of $\ln x$ and $\ln y$:

a)
$$\ln\left(xe^4\sqrt[3]{\frac{x^6}{y^2}}\right) = \dots$$

b)
$$\ln\left(xy^3e^2\left(\frac{x^2}{y^3}\right)^{5/7}\right) = \dots$$

Problem 4. Solve for x in terms of y:

a) $y = \frac{x}{x+2}$
b) $y = \frac{x^3-1}{x^3+1}$
c) $y = \frac{\ln x}{\ln x+2}$

Problem 5. Simplify the following monster expressions:

a)
$$3\left(\frac{x^2+1}{x^2-1}\right)^2 \frac{2x(x^2-1) - 2x(x^2+1)}{(x^2-1)^2} = \dots$$

b)
$$\frac{2x^2(1-x^2)^2 - x^3(2)(1-x^2)(-2x)}{(1-x^2)^4} = \dots$$