10. (5 points) Expand $\boxed{\log_2 x\sqrt{\frac{y}{z}}}$ using the Laws of Logarithms.

$$\log_2 x + \frac{1}{2}\log_2 y - \frac{1}{2}\log_2 z$$

11. (5 points each) Solve.

(a) $10^{1-x} = 6$

$$\log(10^{1-x}) = \log 6$$

$$1 - x = \log 6$$

$$\boxed{1 - \log 6 = x}$$

(b) $\log_6 x + \log_6(x+1) = 1$

$$\log_6(x(x+1)) = 1$$

$$6^1 = x^2 + x$$

$$0 = x^2 + x - 6$$

$$0 = (x+3)(x-2)$$

$x = -3$ or $\boxed{x = 2}$

makes no sense in $\log_6 x$

So this is the only answer.

(c) $e^{2x} + e^x - 20 = 0$

$$(e^x)^2 + e^x - 20 = 0$$

hidden quadratic

$$(e^x + 5)(e^x - 4) = 0$$

$$e^x = -5 \text{ or } e^x = 4$$

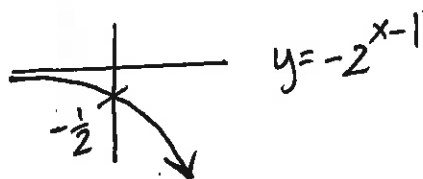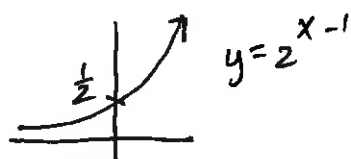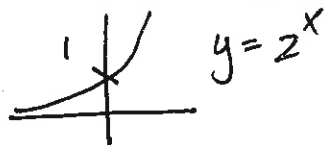makes no sense because $e^x > 0$ always.

So $\ln(e^x) = \ln 4$

So $\boxed{x = \ln 4}$

12. (**6** points each) Sketch the graphs below. Label any asymptotes and intercepts.

(a) $h(x) = 4 - 2^{x-1}$

$y = 2^x$

$y = 2^{x-1}$

$\frac{1}{2}$

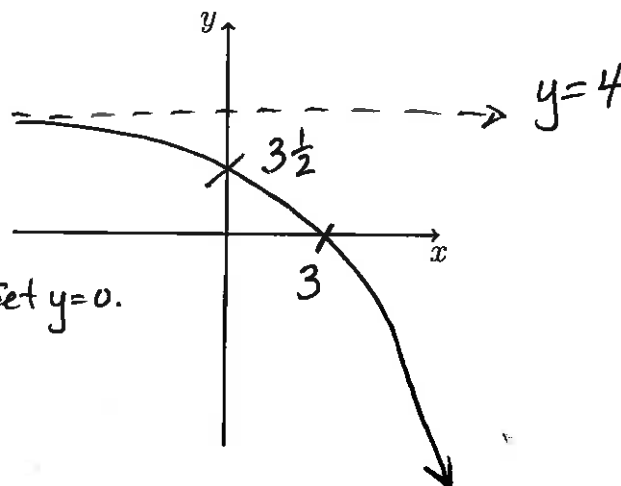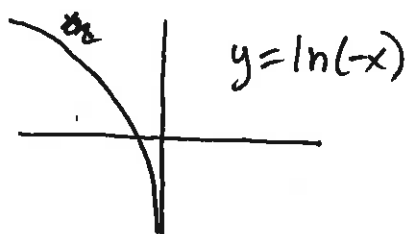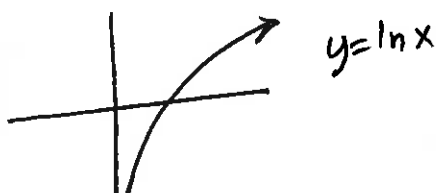$y = -2^{x-1}$

$-\frac{1}{2}$

$y = 4$

$3\frac{1}{2}$

3

x-intercept: Set $y = 0$.

$2^{x-1} = 4 = 2^2$

$x - 1 = 2$

$x = 3$

(b) $f(x) = 1 + \ln(-x)$

$y = \ln x$

$y = \ln(-x)$

$-\frac{1}{e}$
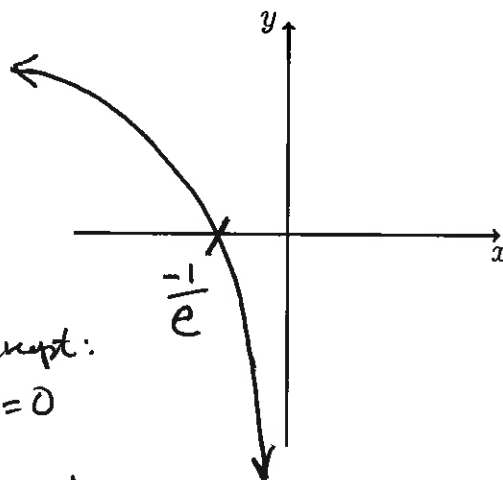
x-intercept:

Set $y = 0$

$\ln(-x) = -1$

$e^{-1} = -x$

$x = -e^{-1}$

EXTRA CREDIT (5 points) A certain population of fish has a relative growth rate of 2.5% per year. How long will it take for the population to double? (Yes. You do have enough information to complete this problem.)

$n = n_o e^{.025t}$

Find t when $n = 2n_o$.

So $2n_o = n_o e^{.025t}$

So $2 = e^{.025t}$

So $\ln 2 = 0.025t$

Finally, $t = \dfrac{\ln 2}{.025}$