

1. [6 points]  
Sketch the graphs of the following functions. You should clearly indicate any asymptotes and axes intercepts.

(a)  $y = |-2^{x+2} + 1|$

(b)  $y = \log_{\frac{1}{2}} |x - 1|$



**2.**

[6 points]

Solve the following equations:

(a)  $2 \log_2 x + \log_{\frac{1}{2}}(2x - 3) = 2$

(b)  $3^{2x-1} - 3^{x+1} + 6 = 0$

**3.**

[5 points]

Let  $x = \log_4 5$  and  $y = \log_3 2$ . Express the following in terms of  $x$  and  $y$ . Simplify your answer.

(a)  $\log_6 10$

(b)  $\log_{\frac{2}{3}} 7.5$

4.

[3 points]

The population of ants in an experimental colony  $t$  days since the the start of the experiment is given by the formula:

$$P(t) = 9000 - 4000e^{-0.03t}$$

- (a) Write down the initial population of the colony.
- (b) The population of the colony approaches  $k$  as  $t$  approaches infinity. State the value of  $k$ .
- (c) Rearrange the formula to find an expression for  $t$  in terms of  $P$ .