

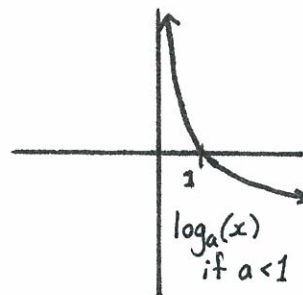
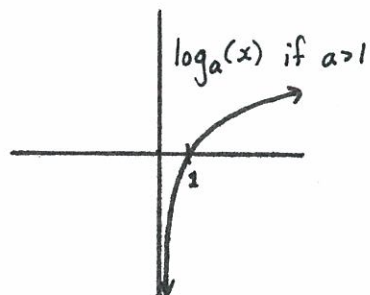
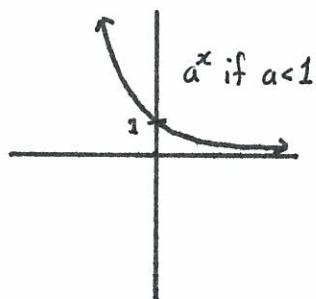
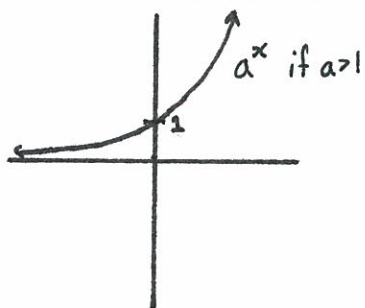
## Review for third exam

There are no explanations on this list. If anything seems unfamiliar, look it up in the text, or ask about it in class, or ask me or someone else outside of class.

- (•) A rational function is a function of the form  $\frac{p(x)}{q(x)}$  where  $p(x)$  and  $q(x)$  are polynomials.
- (•) Any polynomial  $p(x)$  is a rational function since  $p(x) = \frac{p(x)}{1}$  and 1 is a polynomial.
- (•) To graph a rational function  $\frac{p(x)}{q(x)}$ :
  - ① Draw vertical asymptotes at the roots of  $q(x)$ .
  - ① Mark  $x$ -intercepts at the roots of  $p(x)$ .
  - ② Decide whether  $\frac{p(x)}{q(x)}$  is positive or negative between pairs of  $x$ -intercepts and vertical asymptotes.
  - ③ The leading term of  $p(x)$  divided by the leading term of  $q(x)$  determines the graph to the left and right of the  $x$ -intercepts and vertical asymptotes.
  - ④ Connect the pieces drawn so far without crossing vertical asymptotes, and without touching the  $x$ -axis aside from those points marked in step ①.

Below,  $a > 0$  and  $a \neq 1$ .

$$\log_a(a^x) = x \quad \text{and} \quad a^{\log_a(x)} = x$$



$$\underline{a^x a^y = a^{x+y}}$$

$$\frac{a^x}{a^y} = a^{x-y}$$

$$\frac{1}{a^y} = a^{-y}$$

$$a^0 = 1$$

$$(a^x)^y = a^{xy}$$

$$a^{\frac{n}{m}} = \sqrt[m]{a^n} = (\sqrt[m]{a})^n \quad \text{if } n, m \in \mathbb{N}$$

$$\underline{\log_a(zw) = \log_a(z) + \log_a(w)}$$

$$\log_a\left(\frac{z}{w}\right) = \log_a(z) - \log_a(w)$$

$$\log_a(1) = 0$$

$$\log_a(z^w) = w \log_a(z)$$

To solve for  $x$  in an exponential equation:

- Ⓘ Make equation look like  $a^{f(x)} = c$ .
- Ⓜ Rewrite as  $f(x) = \log_a(c)$
- Ⓝ Solve for  $x$ .

To solve for  $x$  in a logarithmic equation:

- Ⓘ Make equation look like  $\log_a(f(x)) = c$
- Ⓜ Rewrite as  $f(x) = a^c$ .
- Ⓝ Solve for  $x$ .