

STUDENT NAME _____

Calculators are allowed. The last page has a list of possibly useful formulas.

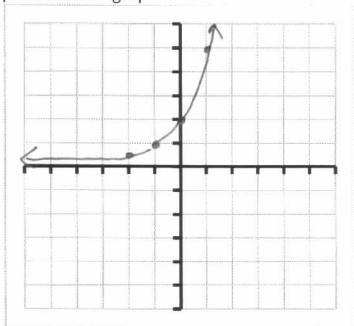
1. What is the domain of $f(x) = \ln(x^2)$?

$$x^2 > 0$$

$$x \neq 0$$

$$\{x : x \neq 0\}$$

2. Sketch the graph of $g(x) = 2^{x+1}$. Make a table of at least 4 values and mark the corresponding points on the graph.



x	y
-1	1
0	2
1	4
2	8
-2	$\frac{1}{2}$

3. Solve for x : $3^{x+3} = 10$

$$(x+3) \ln 3 = \ln 10$$

$$x+3 = \frac{\ln 10}{\ln 3}$$

$$x = -3 + \frac{\ln 10}{\ln 3} = -0.904$$

4. Solve for x : $\log_2(x) - \log_2(x-1) = 2$

$$\log_2\left(\frac{x}{x-1}\right) = 2$$

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

$$x = 4x - 4$$

$$4 = 3x$$

$$x = \frac{4}{3}$$

5. Suppose you know that $\log_2(5) = 2.322$. Find $\log_2(20)$ without using your calculator. (You may use a calculator to check your answer but you must show how you found it without a calculator.)

$$\log_2(20) = \log_2(4 \cdot 5) = \log_2(4) + \log_2(5)$$

$$= 2 + 2.322$$

$$= 4.322$$

6. Write each of the following as single logarithm.

a. $2 \log_3(u) - \log_3(v)$

$$= \log_3(u^2) - \log_3(v)$$
$$= \log_3\left(\frac{u^2}{v}\right)$$

b. $\log_3\left(\frac{1}{x}\right) + \log_3\left(\frac{1}{x^2}\right) = \log_3\left(\frac{1}{x} \cdot \frac{1}{x^2}\right) = \log_3\left(\frac{1}{x^3}\right)$

7. In 2 years you want to have \$100. How much do you need to invest now, at 6% compounded monthly?

$$A = 100$$

$$P = ?$$

$$r = 6\%$$

$$n = 12$$

$$t = 2$$

$$100 = P \left(1 + \frac{0.06}{12}\right)^{24}$$

$$P = \frac{100}{\left(1 + \frac{0.06}{12}\right)^{24}}$$

$$= \$88.72$$

8. The number of bacteria present in a culture at time t (in hours) is $N(t) = 1000e^{0.01t}$
- How many bacteria are present at $t = 0$?
 - What is the population after 4 hours?
 - When will the population reach 1700?

(a) 1000

(b) $N(4) = 1000 e^{0.04} = 1040.81 \approx 1041$

(c) $N(t) = 1700 = 1000 e^{0.01t}$

$$1.7 = e^{0.01t}$$

$$\ln(1.7) = 0.01t$$

$$t = \frac{\ln(1.7)}{0.01} = 53.06 \text{ hours}$$

9. For the quadratic function $f(x) = x^2 + 2x - 3$.
- Put the function in standard form $f(x) = a(x - h)^2 + k$
 - What is the vertex?
 - What is the axis of symmetry?
 - Find the x-intercepts and y-intercepts
 - Sketch the graph

a. $x^2 + 2x - 3 = (x+1)^2 - 1 - 3 = (x+1)^2 - 4$

b. Vertex: $(-1, -4)$

c. $x = -1$

d. y int: $f(0) = -3$

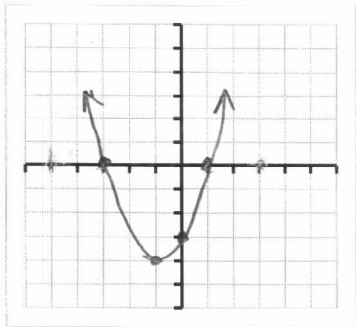
x int: $(x+1)^2 - 4 = 0$

$$(x+1)^2 = 4$$

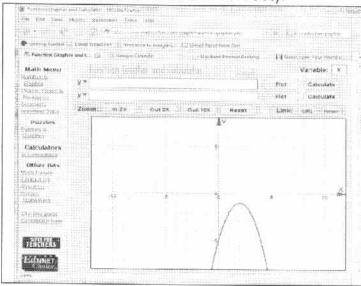
$$x+1 = \pm 2$$

$$x = 1 \pm 2 \quad x = -1, x = 3$$

e



10. Which of the given functions could have this graph? (There may be 0, 1, or more than 1 correct answer. Circle all that are correct).



- a. $f(x) = (x + 2)^2 - 1$
 b. $f(x) = -(x + 2)^2 - 1$
 c. $f(x) = (x - 2)^2 - 1$
 d. $f(x) = -(x - 2)^2 - 1$

opens down both
 vertex (2, -1) only d

CHEAT SHEET

Rules for exponential functions	Rules for logarithmic functions
$a^{s+t} = a^s a^t$	$\log_a(uv) = \log_a(u) + \log_a(v)$
$a^{-x} = \frac{1}{a^x}$	$\log_a\left(\frac{1}{u}\right) = -\log_a u$
$a^0 = 1$	$\log_a(1) = 0$
$a^1 = a$	$\log_a(a) = 1$
$a^{s-t} = \frac{a^s}{a^t}$	$\log_a\left(\frac{u}{v}\right) = \log_a(u) - \log_a(v)$
$(a^s)^t = a^{st}$	$\log_a(u^t) = t \log_a(u)$
$(a^s)^t = a^{st}$	$\log_b(u) = \frac{\log_a(u)}{\log_a(b)}$ $\log_a(u) = \log_a(b) \cdot \log_b(u)$

$$A = P \left(1 + \frac{r}{n}\right)^{nt}$$