Last Name:_____ First Name:_____

1.) True

2.) True

3.) False

4.) False

5.) True

6.) False

7.) $\frac{1}{16}$

8.) 27

9.) 1,000,000

10.) $\frac{4}{9}$

11.) 3

12.) $-\frac{3}{8}$

13.) 2

14.) $\log_e(3)$

15.) $\frac{1}{27}$

16.) $\log_e(6)-5$

17.) $\frac{e^4}{2}$

18.) $\frac{\log_e(7)-4}{3}$

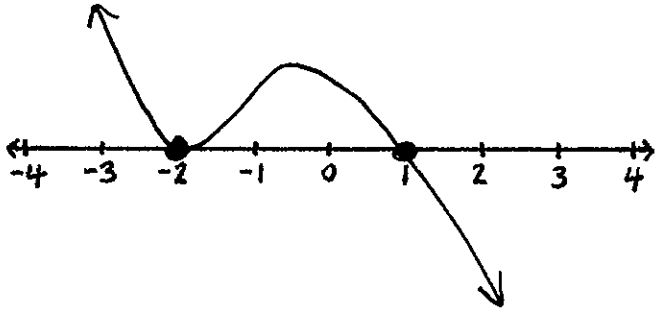
19.) $\frac{7}{e^2-1}$

20.) 1

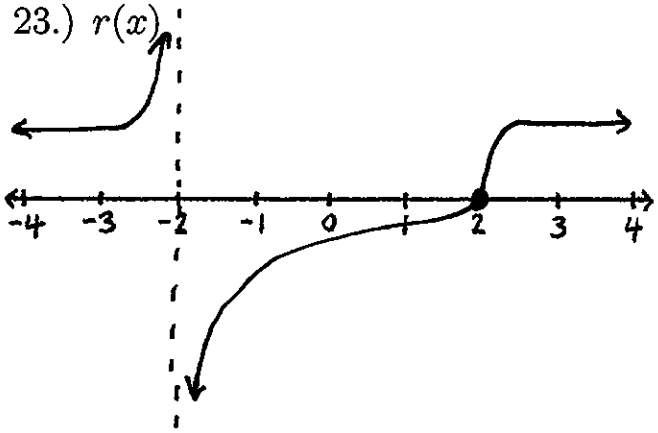
21.) $(x-2)\left(x-\frac{-3+\sqrt{5}}{2}\right)\left(x+\frac{3+\sqrt{5}}{2}\right)$

****

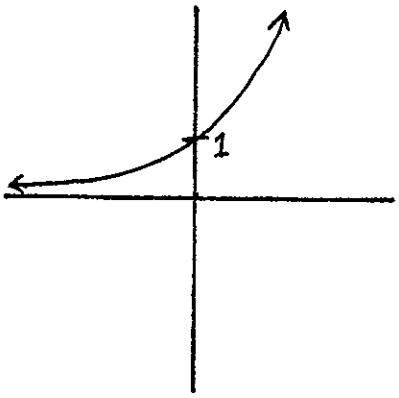
22.) $p(x)$



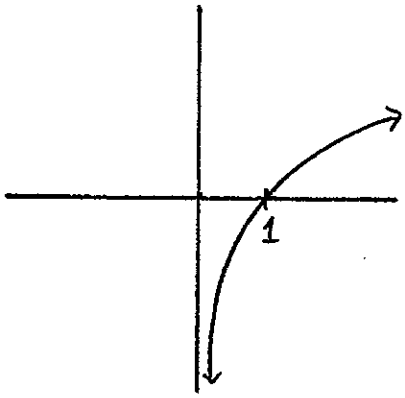
23.) $r(x)$



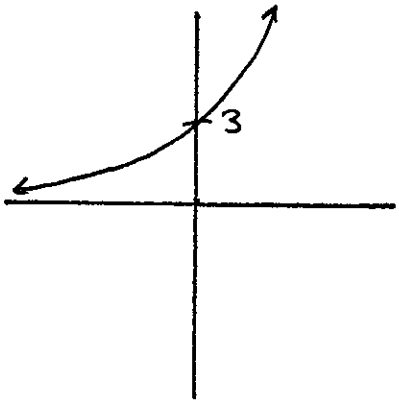
24.) e^x



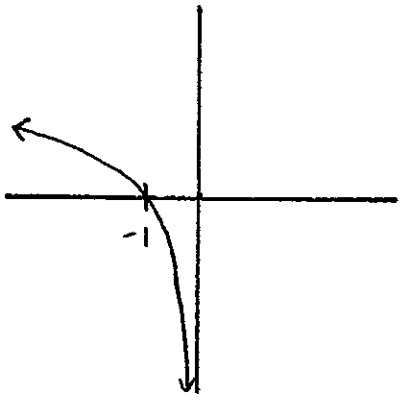
25.) $\log_e(x)$



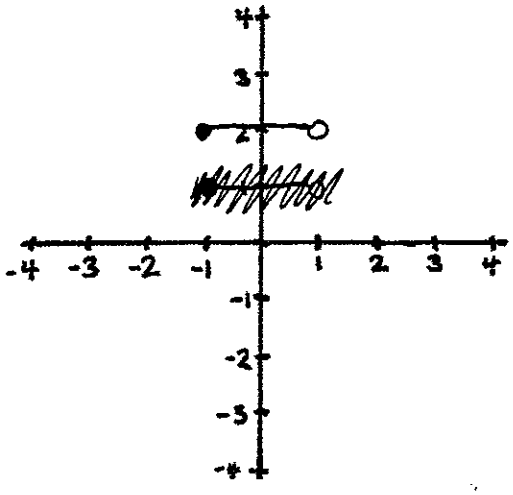
26.) $3e^x$



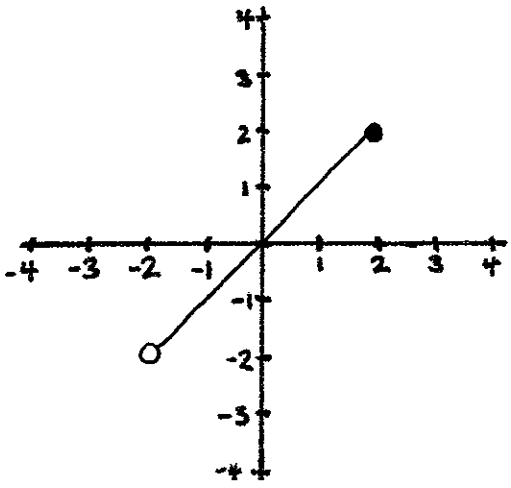
27.) $\log_e(-x)$



28.) $f(x)$



29.) $g(x)$



Third Exam

For #1-6 write the entire word "True" or the entire word "False".

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

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

3.) $\log_a(\frac{z}{w}) = \log_a(z) + \log_a(w)$

4.) $a^x a^y = a^{xy}$

5.) $\log_a(\frac{z}{w}) = \log_a(z) - \log_a(w)$

6.) $\frac{a^x}{a^y} = a^{x+y}$

****

7.) Write $4^{173}4^{-176}4$ as a rational number in standard form.

$4^{173-176+1} = 4^{-2} = \frac{1}{16}$

8.) Write $(9^{\frac{3}{5}})^{\frac{5}{2}}$ as a rational number in standard form.

$9^{(3/5 \cdot 5/2)} = 9^{3/2} = 3^3 = 27$

9.) Write $10,000^{\frac{3}{2}}$ as a rational number in standard form.

$(10^4)^{3/2} = 10^{12/2} = 10^6 = 1,000,000$

10.) Write $(\frac{27}{8})^{-\frac{2}{3}}$ as a rational number in standard form.

$\left(\frac{27}{8}\right)^{-2/3} = \left(\frac{8}{27}\right)^{2/3} = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$

11.) Write $\log_{10}(1,000)$ as a rational number in standard form.

$\log_{10}(10^3) = 3$

12.) Write $\log_3(\frac{1}{\sqrt[3]{27}})$ as a rational number in standard form.

$\log_3\left(3^{-3/8}\right) = -3/8$

13.) What is the greatest integer that is less than $\log_5(37)$?

$5^2 < 37 < 5^3$

$\Rightarrow \quad 2 < \log_5(37) < 3$

14.) Solve for x if $e^x = 3$

$x = \log_e(3)$

15.) Solve for x if $\log_9(x) = -\frac{3}{2}$
(Write your answer as a rational number in standard form.)

$x = 9^{-3/2} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$

16.) Solve for x if $2 + e^{x+5} = 8$

$e^{x+5} = 6$

$x+5 = \log_e(6)$

$x = \log_e(6) - 5$

17.) Solve for x if $4\log_e(2x) = 16$

$$\log_e(2x) = \frac{16}{4} = 4$$

$$2x = e^4$$

$$x = e^4/2$$

18.) Solve for x if $e^{2x+1}e^{x+3} = 7$

$$e^{(2x+1)+(x+3)} = 7$$

$$e^{3x+4} = 7$$

$$3x+4 = \log_e(7)$$

$$3x = \log_e(7) - 4$$

$$x = \frac{\log_e(7)-4}{3}$$

19.) Solve for x if $\log_e(x+7) = 2 + \log_e(x)$

$$\log_e(x+7) - \log_e(x) = 2$$

$$\log_e\left(\frac{x+7}{x}\right) = 2$$

$$\frac{x+7}{x} = e^2$$

$$x+7 = e^2 x$$

$$7 = e^2 x - x = x(e^2-1)$$

$$x = \frac{7}{e^2-1}$$

20.) Find a root of $x^3 + x - 2$

Factors of -2: $1, -1, 2, -2$

$1^3 + 1 - 2 = 0$, so 1 is a root

21.) (2 pts.) Completely factor $x^3 + x^2 - 5x - 2$ (Hint: 2 is a root.)

$$\begin{array}{r|rrrr} 2 & 1 & 1 & -5 & -2 \\ & & 2 & 6 & 2 \\ \hline & 1 & 3 & 1 & 0 \end{array}$$

$x^3 + x^2 - 5x - 2$

$(x-2)$ (x^2+3x+1)

$\left(x - \frac{-3+\sqrt{5}}{2}\right)\left(x + \frac{3+\sqrt{5}}{2}\right)$

Discriminant of x^2+3x+1 is

$3^2 - 4(1)(1) = 9 - 4 = 5$

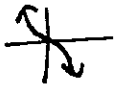
so there are 2 roots:

$\frac{-3+\sqrt{5}}{2}$ and $\frac{-3-\sqrt{5}}{2}$

22.) Graph $p(x) = -2(x+2)(x+2)(x-1)(x^2+3)$

x-int: -2 and 1

in between: $p(0) = -2(0+2)(0+2)(0-1)(0^2+3) > 0$

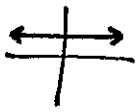
left & right: $-2x^5$ 

23.) Graph $r(x) = \frac{5(x-2)}{2(x+2)}$

vert asym: -2

x-int: 2

in between: $r(1) = \frac{5(-1)}{2(3)} < 0$

left & right: $\frac{5x}{2x} = \frac{5}{2}$ 

24.) Graph e^x and label its y-intercept.

25.) Graph $\log_e(x)$ and label its x-intercept.

26.) Graph $3e^x$ and label its x- and y-intercepts (if there are any).

27.) Graph $\log_e(-x)$ and label its x- and y-intercepts (if there are any).

28.) Graph $f : [-1, 1) \to \mathbb{R}$ where $f(x) = 2$.

29.) Graph $g : (-2, 2] \to \mathbb{R}$ where $g(x) = x$.