Name: ______________________ Period ______________ Date: ____________

Honors Algebra 2 Review for Final

Part I: No Calculator

1. A polynomial f and one zero are given. Find the other zeros of f.

a) $f(x)=x^3+2x^2-20x+24;-6$

$$\begin{array}{r|rrrr} -6 & 1 & 2 & -20 & 24 \\ & & -6 & 24 & -24 \\ \hline & 1 & -4 & 4 & 0 \end{array}$$

zeros: $x=-6, 2$

$f(x) = (x^2 - 4x + 4)(x+6)$

$= (x-2)(x-2)(x+6)$

b) $f(x)=15x^3-119x^2-10x+16;8$

$$\begin{array}{r|rrrr} 8 & 15 & -119 & -10 & 16 \\ & & 120 & 8 & -16 \\ \hline & 15 & 1 & -2 & 0 \end{array}$$

$f(x) = (15x^2 + x - 2)(x-8)$

$= (3x-1)(5x+2)(x-8)$

zeros $x=8, \frac{1}{3}, -\frac{2}{5}$

2. (Calc Active) Find the local max and mins of the following equations.

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

min

$(-0.164, 3.908)$ and $(2.574, -4.494)$

max

$(0.5907, 4.5859)$

b) $f(x)=x^3+11x^2+35x+32$

min $(-2.\overline{3}, -2.482)$

max $(-5, 7)$

3. Find all possible rational zeros of the function

$f(x)=x^8-17x^4+16$

$$\frac{\pm 1, \pm 2, \pm 4, \pm 8, \pm 16}{\pm 1} = \pm 1, \pm 2, \pm 4, \pm 8, \pm 16$$

4. Determine how many possible positive, negative, and imaginary zeros $f(x) = x^{\boxed{5}} - 3x^4 - x^3 + 3x^2 - 6x + 18$ may have.

5 zeros

1 2 3 4

$f(-x) = (-x)^5 - 3(-x)^4 - (-x)^3 + 3(-x)^2 - 6(-x) + 18$

$= -x^5 - 3x^4 + x^3 + 3x^2 + 6x + 18$

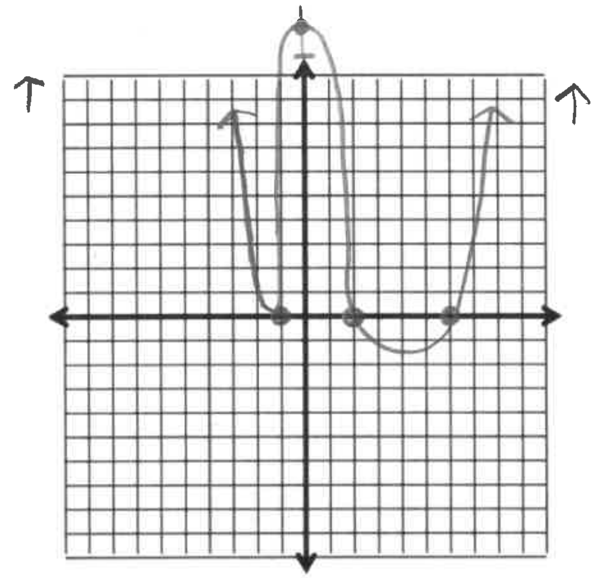
1

4 pos 1 neg

2 pos 1 neg 2 imaginary

0 pos 1 neg 4 imaginary

5. Graph the following function:
$f(x) = (x-6)(x+1)^2(x-2)$
cross bounce cross



Degree: 4

Sign of the Leading Coefficient: pos

Y-intercept: (0, 12)

Zeros: (6, 0) (-1, 0) (2, 0)

Multiplicity of zeros: 1, 2, 1

Domain: $(-\infty, \infty)$

~~Range~~: don't know for certain w/o calc

6. Simplify using properties of exponents

a. $x^m \cdot x^n$

x^{m+n}

b. $\frac{x^m}{x^n}$

x^{m-n}

c. $(x^m)^n$

x^{mn}

d. x^{-n}

$\frac{1}{x^n}$

e. $(xy)^n$

$x^n y^n$

f. $\left(\frac{x}{y}\right)^n$

$\frac{x^n}{y^n}$

7. Simplify

a. $11^{\frac{1}{3}}$ (write as a radical)

$\sqrt[3]{11}$

b. $\sqrt[3]{5^2}$ (write using fractional exponents)

$5^{2/3}$

8. Evaluate

a. $512^{2/3}$

512
2 256
2 128
2 64
2 32
2 16
2 8
2 4 2 2

$\sqrt[3]{512}^{\,2}$

$\sqrt[3]{2^9}^{\,2}$

$(2^3)^2$

$(8)^2$

$\boxed{64}$

b. $(-243)^{1/5}$

243
3 81
3 27
3 9
3 3

$\sqrt[5]{-243}$

$\sqrt[5]{-3^5}$

$\boxed{-3}$

c. $729^{-2/3}$

729
3 243
3^5

$\frac{1}{\sqrt[3]{729}^{\,2}}$

$\frac{1}{\sqrt[3]{3^6}^{\,2}}$

$\frac{1}{(3^2)^2} = \frac{1}{(9)^2}$

$= \boxed{1/81}$

324 = 2 · 162, 162 = 2 · 81, 81 = 3^4

361 = 19 · 19

d. $\frac{1}{81^{-3/4}}$

$= \sqrt[4]{81}^{\,3}$

$= \sqrt[4]{3^4}^{\,3} = 3^3 = \boxed{27}$

e. $\left(\frac{361}{324}\right)^{-1/2}$

$= \frac{\sqrt{324}}{\sqrt{361}}$

$= \frac{\sqrt{2^2\ 3^4}}{\sqrt{19^2}}$

$= \frac{2 \cdot 3^2}{19} = \boxed{\frac{18}{19}}$

f. $(-64)^{4/3}$

$= \sqrt[3]{-64}^{\,4}$

$= \sqrt[3]{-4^3}^{\,4}$

$= (-4)^4$

$= \boxed{256}$

9. Evaluate

a. $\log_{1/81}3 = \boxed{-1/4}$

$\left(\frac{1}{81}\right)^x = 3$

$(3^{-4})^x = 3$

$-4x = 1$ $x = -1/4$

f. $\log_{16}64 = \boxed{3/2}$

$16^x = 64$

$4^{2x} = 4^3$

$2x = 3$ $x = 3/2$

k. $e^{\ln 7}$ $\boxed{=7}$

b. $\log_4 1$ $\boxed{=0}$

g. $\log_4 \frac{1}{\sqrt[3]{16}} = \boxed{-\frac{2}{3}}$

$4^x = \frac{1}{\sqrt[3]{16}}$

$4^x = 16^{-1/3}$

$4^x = 4^{-2/3}$

$x = -2/3$

l. $\ln 1$ $\boxed{=0}$

c. $\ln e^4$ $\boxed{=4}$

h. $\ln e$ $\boxed{=1}$

m. $\log_3 3^4 - \log_8 8^4$

$4 - 4$

$\boxed{0}$

d. $\log \sqrt[5]{10}$ $\boxed{=1/5}$

$10^x = \sqrt[5]{10}$

$10^x = 10^{1/5}$

$x = 1/5$

i. $\log 1000$ $\boxed{=3}$

$10^x = 1000$

$10^x = 10^3$

$x = 3$

n. $\log_2 64 - 7^{\log_7 1}$

$6 - 1$

$\boxed{5}$

e. $5^{\log_5 12}$

$\boxed{12}$

j. $\log_9 3$ $\boxed{=1/2}$

$9^x = 3$

$x = 1/2$

o. $\log_3 \frac{1}{81} + \log_4 64$

$3^x = \frac{1}{81}$ $4^x = 64$

$3^x = 3^{-4}$ $4^x = 4^3$

$-4 + 3$

$\boxed{-1}$

p. $e^{\ln 4}$

$\boxed{=4}$

r. $\ln e^9$

$\boxed{=9}$

t. $10^{\log 0.2}$

$\boxed{=0.2}$

q. $e^{2\ln 3}$

$e^{\ln 3^2}$

$= 3^2$

$\boxed{=9}$

s. $5 \ln e^3$

$= 5(3)$

$\boxed{=15}$

u. $\log_{25} 125$ $\boxed{=3/2}$

$25^x = 125$

$5^{2x} = 5^3$

$2x = 3$

$x = 3/2$

10. Solve for x. Check for extraneous roots.

a. $4(x-2)^3 = 32$

$(x-2)^3 = 8$

$x - 2 = \sqrt[3]{8}$

$x = 2 + 2$

$\boxed{x = 4}$

256

2 128

2 64

2^6

c. $(x-5)^4 = 256$

$x - 5 = \sqrt[4]{256}$

$x = 5 + \sqrt[4]{2^8}$

$= 5 + 2^2$

$\boxed{=9}$

b. $x^6 + 50 = 779$

729

3 243

3^5

$x^6 = 729$

$x = \sqrt[6]{729}$

$x = \sqrt[6]{3^6}$

$\boxed{x = 3}$

d. $m^{3/4} = 27$

$m = 27^{4/3}$

$= \sqrt[3]{27}^4$

$= 3^4$

$\boxed{=81}$

e. $\sqrt{2x-7} = x-3$

$2x-7 = (x-3)^2$

$2x-7 = x^2 - 6x + 9$

$0 = x^2 - 8x + 16$

$0 = (x-4)^2$

$\boxed{x = 4}$

g. $\sqrt{3x+7} = x+1$

$3x+7 = x^2 + 2x + 1$

$0 = x^2 - x - 6$

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

$x = 3, \cancel{-2}$

$\boxed{x = 3}$

f. $3(x-5)^{2/3} - 6 = 18$

$3(x-5)^{2/3} = 24$

$(x-5)^{2/3} = 8$

$x - 5 = 8^{3/2}$

$x = 5 \pm \sqrt{8}^{3} = 5 \pm \sqrt{2^3}^{3}$

$= 5 \pm \sqrt{2^9} = 5 \pm 2^4\sqrt{2} = \boxed{5 \pm 16\sqrt{2}}$

h. $\sqrt{x-4} = \sqrt{2x}$

$x - 4 = 2x$

$\cancel{-4 = x}$

$\boxed{\text{no solution}}$

11. Simplify.

a. $\frac{x^3-27}{x^2-9}$

$= \frac{(x-3)(x^2+3x+9)}{(x-3)(x+3)}$

$= \boxed{\frac{x^2+3x+9}{x+3}}$

d. $\sqrt[4]{8} \cdot \sqrt[4]{8}$

$= \sqrt[4]{64}$

$= \sqrt[4]{2^6}$

$\boxed{= 2\sqrt[4]{4}}$

g. $\sqrt[5]{64x^7y^{20}z^{23}}$

$= \sqrt[5]{2^5 \cdot 2\, x^5 x^2 y^{20} z^{20} z^3}$

$= \boxed{2xy^4z^4 \sqrt[5]{2x^2z^3}}$

b. $\frac{x^2+11x+28}{2x^2+8x}$

$= \frac{(x+7)(x+4)}{2x(x+4)}$

$= \boxed{\frac{x+7}{2x}}$

e. $10\sqrt[5]{4} - 18\sqrt[5]{4}$

$\boxed{-8\sqrt[5]{4}}$

48
2 24
2 12

750
2 375
5 75
3 25
5 5

h. $(-48)^{1/3} + (750)^{1/3}$

$\sqrt[3]{-2^3 \cdot 6} + \sqrt[3]{5^3 \cdot 6}$

$-2\sqrt[3]{6} + 5\sqrt[3]{6}$

$\boxed{3\sqrt[3]{6}}$

c. $\frac{27e^7}{9e^3}$

$\boxed{= 3e^4}$

f. $\sqrt[3]{81x^7}$

$\sqrt[3]{3^4x^7}$

$\boxed{3x^2\sqrt[3]{3x}}$

i. $2\sqrt{3} + 7\sqrt{3}$

$\boxed{9\sqrt{3}}$

j. $9\sqrt{2} - 5\sqrt{2}$

$\boxed{4\sqrt{2}}$

k. $\sqrt[3]{7} + 5\sqrt[3]{56}$

$\sqrt[3]{7} + 5\sqrt[3]{8 \cdot 7}$

$\sqrt[3]{7} + 5 \cdot 2\sqrt[3]{7}$

$\boxed{11\sqrt[3]{7}}$

l. $17\sqrt[5]{4} - 2\sqrt[5]{128}$

$17\sqrt[5]{4} - 2\sqrt[5]{2^7}$

$17\sqrt[5]{4} - 2 \cdot 2\sqrt[5]{2^2}$

$17\sqrt[5]{4} - 4\sqrt[5]{4}$

$\boxed{13\sqrt[5]{4}}$

12. Rationalize:

a) $\frac{3}{7-\sqrt{5}} \cdot \frac{7+\sqrt{5}}{7+\sqrt{5}}$

$\frac{21+3\sqrt{5}}{49-5}$

$\boxed{\frac{21+3\sqrt{5}}{44}}$

b) $\frac{4}{3+\sqrt{2}} \quad \frac{3-\sqrt{2}}{3-\sqrt{2}}$

$\frac{12-4\sqrt{2}}{9-2}$

$\boxed{\frac{12-4\sqrt{2}}{7}}$

c) $\frac{2}{\sqrt[3]{32}}$

$\frac{2}{\sqrt[3]{2^5}} \cdot \frac{\sqrt[3]{2}}{\sqrt[3]{2}}$

$\frac{2\sqrt[3]{2}}{\sqrt[3]{2^6}}$

$\frac{2\sqrt[3]{2}}{2^2}$

$\boxed{\frac{\sqrt[3]{2}}{2}}$

d) $\frac{5}{\sqrt[3]{9}}$

$\frac{5}{\sqrt[3]{3^2}} \cdot \frac{\sqrt[3]{3}}{\sqrt[3]{3}}$

$\boxed{\frac{5\sqrt[3]{3}}{3}}$

13. Let $f(x) = x^{11} - 4$. Find $f^{-1}(x)$ and verify your answer.

$x = y^{11} - 4$

$x + 4 = y^{11}$

$\boxed{\sqrt[11]{x+4} = f^{-1}(x)}$

verify:

$f(f^{-1}(x)) = \left(\sqrt[11]{x+4}\right)^{11} - 4$

$= x + 4 - 4$

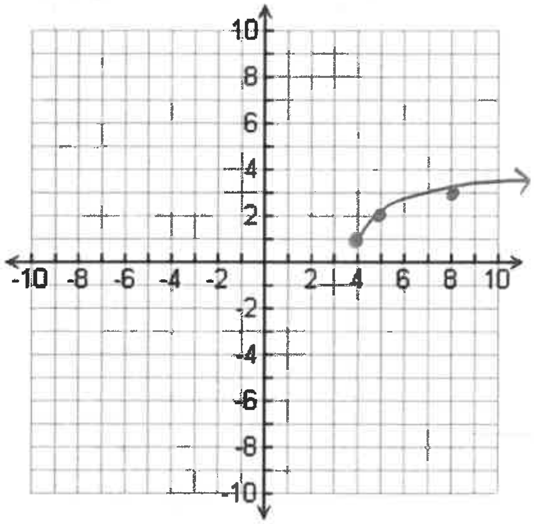
$= x$ ✓

$f^{-1}(f(x)) = \sqrt[11]{(x^{11} - 4) + 4}$

$= \sqrt[11]{x^{11}}$

$= x$ ✓

14. Graph the function $f(x) = \sqrt{x-4} + 1$. Find the domain, range, and state ALL transformations. $\rightarrow 4 \quad \uparrow 1$



Domain: $[4, \infty)$

Range: $[1, \infty)$

Transformations:

right 4

up 1

15. Solve:

a) $4^{2x+4} = 16^{3x-6}$

$4^{2x+4} = (4^2)^{3x-6}$

$2x+4 = 6x-12$

$16 = 4x$

$\boxed{x = 4}$

b) $(0.25)^{x+8} = (0.5)^{x^2+1}$

$(\frac{1}{4})^{x+8} = (\frac{1}{2})^{x^2+1}$

$\left[(\frac{1}{2})^2\right]^{x+8} = (\frac{1}{2})^{x^2+1}$

$2x+16 = x^2+1$

$0 = x^2 - 2x - 15$

$0 = (x-5)(x+3)$

$\boxed{x = 5, -3}$

c) $\log_3(1-3x)+1=5$

$\log_3(1-3x) = 4$

$3^4 = 1-3x$

$81 = 1-3x$

$80 = -3x$

$\boxed{-\frac{80}{3} = x}$

d) $\log_3(x+2) - \log_3(x-1) = 2$

$\log_3 \frac{x+2}{x-1} = 2$

$3^2 = \frac{x+2}{x-1}$

$9 = \frac{x+2}{x-1}$

$9x - 9 = x + 2$

$8x = 11$

$\boxed{x = \frac{11}{8}}$

16. Perform the indicated operation. Write your answer in simplest form.

a) $\dfrac{x^3-8}{3x^2-10x+8} \cdot \dfrac{6x^2-8x}{2x^3+4x^2+8x}$ $2x(x+2x+4)$

$\dfrac{\cancel{(x-2)}\cancel{(x^2+2x+4)}}{\cancel{(3x-4)}\cancel{(x-2)}} \cdot \dfrac{\cancel{2x}\cancel{(3x-4)}}{\cancel{2x}\cancel{(x+2x+4)}}$

$\boxed{=1}$

b) $\dfrac{x^3+4x}{2x-1} \div \dfrac{x^4-16}{x^2-4x-12}$

$\dfrac{x\cancel{(x^2+4)}}{2x-1} \cdot \dfrac{(x-6)(x+2)}{(x^2-4)\cancel{(x^2+4)}}$

$\dfrac{x}{2x-1} \cdot \dfrac{(x-6)\cancel{(x-2)}}{\cancel{(x-2)}(x+2)} = \boxed{\dfrac{x(x-6)}{(2x-1)(x+2)}}$

c) $\dfrac{16x}{4x-8} \div \dfrac{x^2}{x^2-4} \cdot \dfrac{x+6}{8}$

$\dfrac{\cancel{16x}^{2}}{4\cancel{(x-2)}} \cdot \dfrac{\cancel{(x-2)}(x+2)}{\cancel{x^2}\,x} \cdot \dfrac{x+6}{\cancel{8}}$

$\dfrac{\cancel{2}(x+2)(x+6)}{\cancel{4}_{2}x} = \boxed{\dfrac{(x+2)(x+6)}{2x}}$

d) $\dfrac{x+2}{x^2-1} \cdot \dfrac{x^2+2x-3}{4x} \div \dfrac{x^2+5x+6}{8x^2}$

$\dfrac{\cancel{x+2}}{(x+1)\cancel{(x-1)}} \cdot \dfrac{\cancel{(x+3)}\cancel{(x-1)}}{\cancel{4x}} \cdot \dfrac{\cancel{8x^2}^{2x}}{\cancel{(x+3)}\cancel{(x+2)}}$

$\boxed{\dfrac{2x}{x+1}}$

17. Find the LCD

$\dfrac{1}{x+4}, \dfrac{3x}{2(x-3)}, \dfrac{2x-5}{x^2+x-12}$

$(x+4)(x-3)$

$\boxed{\text{LCD} \rightarrow 2(x+4)(x-3)}$

18. Perform the indicated operation. Write your answer in simplest form.

a) $\dfrac{x+2}{x-3} - \dfrac{3x-5}{2x+1} + \dfrac{3x^2+2x+23}{2x^2-5x-3}$

$\dfrac{2x+1}{2x+1}\,\dfrac{x+2}{x-3} - \dfrac{3x-5}{2x+1}\,\dfrac{x-3}{x-3} + \dfrac{3x^2+2x+23}{(2x+1)(x-3)}$

$\dfrac{(2x+1)(x+2)-(x-3)(3x-5)+3x^2+2x+23}{(2x+1)(x-3)}$

$\dfrac{2x^2+5x+2-(3x^2-14x+15)+3x^2+2x+23}{(2x+1)(x-3)}$

$\boxed{\dfrac{2x^2+21x+10}{(2x+1)(x-3)}}$

b) $\dfrac{(x+2)(2x+1)}{(x-1)(2x+1)} + \dfrac{(x+3)(x-1)}{(2x+1)(x-1)} - \dfrac{x^2+4x+4}{(2x+1)(x-1)}$

$\dfrac{2x^2+5x+2+x^2+2x-3-x^2-4x-4}{(x-1)(2x+1)}$

$\dfrac{2x^2+3x-5}{(x-1)(2x+1)}$

$\dfrac{(2x+5)\cancel{(x-1)}}{\cancel{(x-1)}(2x+1)}$

$\boxed{\dfrac{2x+5}{2x+1}}$

19. Solve. Be sure to state any extraneous solutions.

$$\left[\frac{6x^2}{x^2-16}-\frac{3x}{x+4}=\frac{4}{x-4}\right](x-4)(x+4)$$

$(x-4)(x+4)$

$6x^2 - 3x(x-4) = 4(x+4)$

$6x^2 - 3x^2 + 12x = 4x + 16$

$3x^2 + 8x - 16 = 0$

$(3x-4)(x+4) = 0$

$x = 4/3, \cancel{-4}$

$\boxed{x = 4/3}$

20. For the following questions, let $f(x) = 5x^4 - 3x^2$ and $g(x) = 4x^4$. Perform the indicated operations and **state the domain.**

a) $f(x)+g(x)$

$= 5x^4 - 3x^2 + 4x^4$

$\boxed{= 9x^4 - 3x^2}$

$(-\infty, \infty)$

b) $f(x)-g(x)$

$= 5x^4 - 3x^2 - 4x^4$

$\boxed{= x^4 - 3x^2}$

$(-\infty, \infty)$

c) $f(x)\cdot g(x)$

$= (5x^4 - 3x^2)4x^4$

$\boxed{= 20x^8 - 12x^6}$

$(-\infty, \infty)$

d) $\dfrac{f(x)}{g(x)}$

$= \dfrac{5x^4 - 3x^2}{4x^4}$

$\boxed{= \dfrac{5x^2 - 3}{4x^2}}$

$(-\infty, 0)\cup(0, \infty)$

e) $f(g(x))$

$= 5(4x^4)^4 - 3(4x^4)^2$

$= 5(256x^{16}) - 3(16x^8)$

$= \boxed{1280x^{16} - 48x^8}$

$(-\infty, \infty)$

21. For the following questions, let $f(x) = \sqrt{x-3}$ and $g(x) = 2x^2$. Perform the indicated operations.

a) domain of $f(x)$ $[3, \infty)$

b) domain of $g(x)$

$(-\infty, \infty)$

c) $f(g(4))$

$\sqrt{2(4)^2 - 3} = \boxed{\sqrt{29}}$

d) $g(f(4))$

$2\left(\sqrt{4-3}\right)^2$

$= 2\sqrt{1}^2 = \boxed{2}$

e) $f(g(x))$

$= \sqrt{2x^2 - 3}$

f) $g(f(x))$

$= 2\sqrt{x-3}^2$

$= 2(x-3)$

$= 2x - 6$

22. Solve the exponential equations:

Calc but work for credit

a) $5e^{3x} - 9 = 28$

$5e^{3x} = 37$

$e^{3x} = \frac{37}{5}$

$3x = \ln 37/5$

$x = \frac{1}{3}\ln\frac{37}{5}$

$\boxed{x \approx 0.667}$

b) $3^{x-2} + 4 = 11$

$3^{x-2} = 7$

$x - 2 = \log_3 7$

$x = \log_3 7 + 2 \approx \boxed{3.771}$

23. Expand the expressions. Simplify when appropriate.

a) $\log_3\left(\frac{x^3}{81y^2}\right)$

$\log_3 x^3 - \log_3 81y^2$

$3\log_3 x - (\log_3 81 + \log_3 y^2)$

$3\log_3 x - 4 - 2\log_3 y$

b) $\log\left(10^{-5} z^8 \sqrt[3]{x^5}\right)$

$-5\log \cancel{10}^{1} + 8\log z + \frac{5}{3}\log x$

$-5 + 8\log z + 5/3 \log x$

c) $\log_{\frac{1}{2}} \sqrt{x y}$

$\log_{1/2} x^{1/2} + \log_{1/2} y^{1/2}$

$\frac{1}{2}\log_{1/2} x + \frac{1}{2}\log_{1/2} y$

d) $\ln xy$

$\ln x + \ln y$

24. Use the properties of logarithms to condense the expressions (write as one logarithm).

a) $4\log 2+\log\frac{1}{2}-3\log c$

$= \log 2^4 + \log \frac{1}{2} - \log c^3$

$= \log \frac{16(\frac{1}{2})}{c^3} = \boxed{\log \frac{8}{c^3}}$

b) $3\ln a-2\ln b-\ln a$

$= \ln a^3 - \ln b^2 - \ln a$

$= \ln \frac{a^3}{b^2} - \ln a$

$= \ln \frac{a^3}{b^2} \div a$

$= \ln \frac{a^3}{b^2 a}$

$= \boxed{\ln \frac{a^2}{b^2}}$

c) $\ln 4xy^2-2\ln x^2 y$

$= \ln \frac{4xy^2}{(x^2y)^2} = \ln \frac{4xy^2}{x^4y^2} = \boxed{\ln \frac{4}{x^3}}$

d) $\log_5 \sqrt[3]{x^2 y}+\log_5 \sqrt[3]{x y^5}$

$= \log_5 \sqrt[3]{x^3 y^6}$

$= \boxed{\log_5 x y^2}$

25. Solve the logarithmic equations. Check your answer for extraneous solutions.

a) $5=\log_x 32$

$x^5 = 32$

$x = \sqrt[5]{32}$

$\boxed{x = 5}$

b) $\log_2 x+\log_2(x+2)=3$

$\log_2(x^2+2x) = 3$

$2^3 = x^2 + 2x$

$0 = x^2 + 2x - 8$

$0 = (x+4)(x-2)$

$x = \cancel{-4}, 2$

$\boxed{x = 2}$

c) $\log_4 x-\log_4(x-3)=1$

$\log_4 \frac{x}{x-3} = 1$

$4^1 = \frac{x}{x-3}$

$4x - 12 = x$

$3x = 12$

$\boxed{x = 4}$

d) $2\ln 3x=4$

$\ln 3x = 2$

$e^2 = 3x$

$\frac{1}{3}e^2 = x$

$\boxed{x \approx 2.463}$

e) $\ln(x-2)+\ln(2x-3)=2\ln x$

$\ln (x-2)(2x-3) = \ln x^2$

$2x^2 - 4x - 3x + 6 = x^2$

$x^2 - 7x + 6 = 0$

$(x-6)(x-1) = 0$

$x = 6, \cancel{1}$

$\boxed{x = 6}$

f) $\log(z-3)=2$

$10^2 = z - 3$

$\boxed{103 = z}$

★ Know equations for compound interest

$A = Pe^{rt}$ and $A = P(1 + \frac{r}{n})^{nt}$