Completely factor $2x^4 - 14x^2 - 36$

$2(x^4 - 7x^2 - 18)$
$2(x^2 - 9)(x^2 + 2)$
$\mathbf{2(x - 3)(x + 3)(x^2 + 2)}$

Add and simplify

$$\frac{5x}{3x+9} + \frac{3}{x^2-9}$$

$$\frac{5x(x-3)}{3(x+3)(x-3)} + \frac{3 \cdot 3}{3(x+3)(x-3)}$$

$$\boxed{\frac{5x^2-15x+9}{3(x+3)(x-3)}}$$

Simplify as much as possible

$$\frac{(81m)^3}{(81m)^{7/2}}$$

$$(81m)^{\frac{6}{2}-\frac{7}{2}}$$

$$= (81m)^{-1/2} = \frac{1}{(81m)^{1/2}} = \frac{1}{\sqrt{81m}} = \frac{1}{9\sqrt{m}}$$

Subtract and simplify

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

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

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

$$= \frac{6x^2-24x}{9x^2} = \boxed{\frac{3x-8}{3x}}$$

Determine the inverse of

$$y = \frac{1}{3}x^8$$

$$x = \frac{1}{3}y^8$$

$$3x = y^8$$

$$y = \sqrt[8]{3x}$$

Multiply and simplify

$$\frac{x^2 - 10x + 21}{x^2 - x - 12} \cdot \frac{x^2 - 2x - 8}{x^2 - 13x + 42}$$

$$\frac{(x - \cancel{7})(x - 3)(x - \cancel{4})(x + 2)}{(x - \cancel{4})(x + 3)(x - 6)(x - \cancel{7})}$$

$$\boxed{\frac{x^2 - x - 6}{(x + 3)(x - 6)}}$$

Condense: 4ln2 - 2ln8

$\ln(2^4/8^2) = \ln(16/64) = \ln(1/4)$

Rewrite using a common base. Then solve.

$$5^x \cdot \left(\frac{1}{125}\right)^{4x} = 25^{3x+2}$$

$5^x * (5^{-3})^{4x} = (5^2)^{3x+2}$

x -3(4x) = 2(3x + 2)
x - 12x = 6x + 4
-11x = 6x + 4
-17x = 4
x = - 4/17

Convert to logarithmic form
$3^4 = 81$

$\log_3 81 = 4$

Factor $6x^2 - 11x - 35$

$(2x - 7)(3x + 5)$

Simplify

$$\left(81s^{2}t^{12}q^{10}\right)^{3/4}$$

$$3^{3}s^{6/4}t^{36/4}q^{30/4}$$

$$27s^{3/2}t^{9}q^{28/4}q^{2/4}$$

$$27\cdot\sqrt{s^{3}}\,t^{9}q^{7}\,q^{1/2}$$

$$27\sqrt{s^{3}}\,t^{9}q^{7}\sqrt{q}$$

$$27t^{9}q^{7}\sqrt{s^{3}q}$$

Evaluate

$$\left(216^{1/3}\right)\left(100^{3/2}\right)$$

$$\sqrt[3]{216}\cdot\sqrt{100}^{\,3}$$

$$6\cdot 10^{3}$$

$$6\cdot 1000$$

$$\boxed{6000}$$

Solve for v: logv = 3

$10^3 = v$

v = 1000

Simplify

$\sqrt[5]{32m^{20}n^{21}p}$

$32^{1/5}m^{20/5}n^{21/5}p^{1/5}$

$2m^4n^{20/5}n^{1/5}p^{1/5}$

$\boxed{2m^4n^4 \cdot \sqrt[5]{np}}$

Describe in words how to evaluate $64^{4/3}$

Take the cube root of 64, and then raise that number to the fourth power

*inside/outside
*power/root

Expand

$$\log\left(\frac{x^5y^7}{z^3}\right)$$

5logx + 7logy - 3logz

Simplify

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

$= 3^3$

$= \mathbf{27}$

Solve for x

$(27x^3)^{1/3} = 30$

$3x = 30$

$\mathbf{x = 10}$

Determine the inverse of

$$f(x)=\frac{x-8}{3}$$

$$x=\frac{y-8}{3}$$

$$3x=y-8$$

$$\boxed{y=3x+8}$$

What are the restrictions on the function

$$\frac{x^2-9x+20}{x^2-5x-14}$$

$$\frac{(x-5)(x-4)}{(x-7)(x+2)}$$

$\boxed{x \neq}$ x cannot be 7 or -2

Solve for m: $\log_m 49 = 2$

$m^2 = 49$

m = 7

Solve the equation.

$\sqrt{2x-3} - 2 = 10$

2x - 3 = 144 and 2x - 3 = -144
2x = 147 and 2x = -141
x = 73.5 and x = -70.5

x = 73.5
x = -70.5 is EXTRANEOUS because it produces a negative number under the radical when substituted back into the original equation

What is the extraneous solution to $\sqrt{x-5}+2=4$?

x - 5 = 16 and x - 5 = -16
x = 21 and **x = -11**
valid **EXTRANEOUS because produces a negative number under the radical when substituted back into the original equation**

Simplify

$$\sqrt[3]{729q^{32}r^{60}s}$$

$$9q^{32/3}r^{60/3}s^{1/3}$$

$$9q^{30/3}q^{2/3}r^{20}s^{1/3}$$

$$9q^{10}\cdot\sqrt[3]{q^2}\,r^{20}\cdot\sqrt[3]{s}$$

$$\boxed{9q^{10}r^{20}\cdot\sqrt[3]{q^2s}}$$

Condense $\log_3 8 + \log_3 5$

$\log_3(40)$

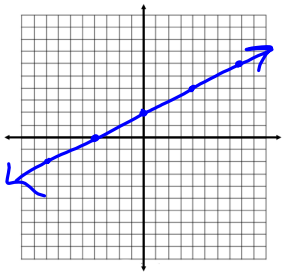
Divide and simplify

$$\frac{4x^2-12x}{x^2+9x+14} \div \frac{3x^2-9x}{x^2-4}$$

$$\frac{4\cancel{x}\cancel{(x-3)}}{(x+7)\cancel{(x+2)}} \cdot \frac{\cancel{(x+2)}(x-2)}{3\cancel{x}\cancel{(x-3)}}$$

$$\boxed{\frac{4x-8}{3x+21}}$$

What are 3 points that could be used to sketch a graph of the inverse of the blue function below?



(0, -4)
(-2, -8)
(2, 0)
(4, 4)
(6, 8)

Solve the equation.

$$\frac{\sqrt[3]{(3x+6)^5}}{-2} = -16$$

$$\sqrt[3]{(3x+6)^5} = 32$$

$$\left((3x+6)^{5/6}\right)^{6/5} = 32^{6/5}$$

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

$$3x+6 = 64$$

$$3x = 58$$

$$\boxed{x = 58/3}$$

If two functions are inverses, their graphs are reflections of each other over which line?

the line y = x
since x and y (inputs and outputs) are switched :)

Evaluate

$49^{-3/2}$

$\frac{1}{49^{3/2}} = \frac{1}{\sqrt{49}^{3}} = \boxed{\frac{1}{343}}$

Solve the equation.
How do the restrictions affect the solution?

$$\frac{x^2+2x-8}{x^3+3x^2}+\frac{5}{x^3+3x^2}=\frac{x+6}{x^2}$$

$$\frac{x^2+2x-8}{x^2(x+3)}+\frac{5}{x^2(x+3)}=\frac{x+6(x+3)}{x^2(x+3)}$$

$$x^2+2x-3=x^2+9x+18$$

$$2x-3=9x+18$$

$$-7x=21$$

$$x=-3$$

but $x\neq 0$
$x\neq -3$

SO...
NO solution
:)

Simplify

$$\frac{x^2-4x-45}{x^2-3x-40}$$

$$\frac{(x-9)\cancel{(x+5)}}{(x-8)\cancel{(x+5)}}$$

$$\boxed{\frac{x-9}{x-8}}$$

Verify that f(x) and g(x) are inverses

$f(x) = -\frac{1}{3}x - 2$

$g(x) = -3x - 6$

$(f \circ g)(x) = -\frac{1}{3}(-3x - 6) - 2$

$= x + 2 - 2 = x$ ✓

$(g \circ f)(x) = -3(-\frac{1}{3}x - 2) - 6$

$= x + 6 - 6 = x$ ✓

Determine the value of x

$\log_9 8 = x\log_9 2$

$\log_9 8 = \log_9 2^x$

$8 = 2^x$

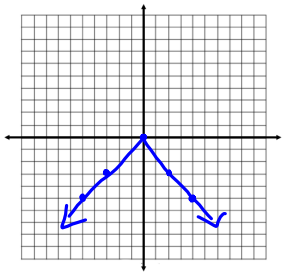
x = 3

Divide using synthetic division $4x^3 - 2x^2 + 3x - 5 \div (x - 3)$

	4	0	-2	3	-5
x=3	↓	12	36	102	315
	4	12	34	105	310

$$\boxed{4x^3 + 12x^2 + 34x + 105 + \frac{310}{x-3}}$$

What are 3 points that could be used to sketch a graph of the inverse of the blue function below?



(0,0)

(-3, -3)

(3, 2)

(-5, -5)

(-5, 4)

Determine the value of x

log125 = xlog5

log125 = $\log 5^x$

125 = 5^x

x = 3

Determine the value of x

$\log_4 64 = x\log_4 4$

$\log_4 64 = \log_4 4^x$

$64 = 4^x$

$x = 3$

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

A is the total accumulated amount,
P is the initial (principal) amount, r is the rate as a decimal,
n is the number of times interest is compounded per year, and t is the number of years.

You place $1000 in a savings account with an annual interest rate of 1.5%. The amount of the investment in 7 years if compounding occurs monthly is...

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

P: 1000
r: .015
n: 12
t: 7

$$A = 1000\left(1+\left(\frac{.015}{12}\right)\right)^{12 \cdot 7}$$

$$\boxed{\$1110.64}$$

Condense

$$2(\log_3 m + \log_3 n) - 4\log_3 p$$

$$\log_3\left(\frac{m^2 n}{p^4}\right)$$

A family purchased a shore house for $459,750 in 2003. The value of the home appreciated 1.4% each year.

Use the exponential growth formula $A = A_0(1 + r)^t$.

$A = A_0(1+r)^t$

A. How much was the house worth in 2014?

B. Approximately when will the home be worth $999,000? Round to the nearest year.

A. $A = 459750(1.014)^{11}$

$\approx \boxed{\$535721.71}$

B. $\frac{999000}{459750} = \frac{459750(1.014)^t}{459750}$

$\log\left(\frac{999000}{459750}\right) = t\log(1.014)$

$t = \frac{\log\left(\frac{999000}{459750}\right)}{\log(1.014)} \approx 55.8$ years

$\boxed{\approx 56 \text{ years} / 2059}$

Describe the end behavior for $-x^9 + 3x^2 - 4$

Neg. odd

rises left

falls right

As $x \to -\infty, f(x) \to \infty$

As $x \to \infty, f(x) \to -\infty$

Determine all roots and multiplicities of

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

$x = 0$ (M.3)

$x = 2$ (M.2)

$x = -3/2$ (M.1)

Rewrite as b^x where x is a fraction

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

$$\frac{b^{3/5}}{b^{2/3}} = b^{3/5 - 2/3}$$

$$* \frac{3}{5} - \frac{2}{3} = \frac{9}{15} - \frac{10}{15} = \frac{-1}{15}$$

so $b^{-1/15}$

If x - 5 is a factor of P(x), what is P(5), and why?

zero, because if a binomial is a factor, the remainder must be zero, since it would divide in evenly

Solve log10 = x

$10^x = 10$

$x = 1$

Solve

$$\sqrt[4]{(3x-1)^3} - 2 = 25$$

$$\left((3x-1)^{3/4}\right)^{4/3} = 27^{4/3}$$

$$3x-1 = \sqrt[3]{27}^{\,4}$$

$$3x-1 = 3^4$$

$$3x-1 = 81$$

$$3x = 82$$

$$\boxed{x = 82/3}$$

Classify the polynomial by degree and number of terms

$5x^3 - 2x^2 - 9$

cubic trinomial

Evaluate $\log_7 1$

$7^x = 1$

x = 0
***anything to the zero power is 1**
***if the argument is 1, the exponent must be 0**

Solve $\log_x 27 = 3$

$x^3 = 27$

$x = 3$

Determine the inverse of

$$f(x) = \sqrt{x+3}$$

$$x = \sqrt{y+3}$$

$$x^2 = y+3$$

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

Evaluate

$$32^{3/5}$$

$$\sqrt[5]{32}^{\,3}$$

$$2^3$$

$$\boxed{8}$$

Determine which is a factor of $x^3 + 7x^2 + 7x - 15$

A. x - 3

B. x + 3

C. x - 5

$$\begin{array}{r|rrrr} x=3 & 1 & 7 & 7 & -15 \\ & \downarrow & 3 & 30 & 111 \\ \hline & 1 & 10 & 37 & -96 \end{array} \times$$

$$\begin{array}{r|rrrr} x=-3 & 1 & 7 & 7 & -15 \\ & \downarrow & -3 & -12 & 15 \\ \hline & 1 & 4 & -5 & 0 \end{array} \checkmark$$

remainder is zero :)

$\boxed{x+3 \text{ is a factor}}$

Rewrite using a common base. Then solve.

$$\frac{16^{8x+1}}{2^{3x}} = 8^4$$

$$\frac{(2^4)^{8x+1}}{2^{3x}} = (2^3)^4$$

$$4(8x+1) - 3x = 3(4)$$

$$32x + 4 - 3x = 12$$

$$29x = 8$$

$$\boxed{x = 8/29}$$

Determine the value of x

$\log_5 1000 = x\log_5 10$

$\log_5 1000 = \log_5 10^x$

$1000 = 10^x$

x = 3

Simplify

$\sqrt[3]{125}^2$

5^2

$= \boxed{25}$

Write the factored form of

a polynomial whose roots are

-3, 2 (M.2), and 1/2

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

Solve $7238^{2x + 5} = 7238^{3x - 10}$

$2x + 5 = 3x - 10$

$-x = -15$

$x = 15$

If $f(x) = 3x - 19$, what is $(f \circ f^{-1})(23)$?

23

How many solutions does the polynomial have?

$f(x) = -8x^4 + 2x - 9x^7 + 1$

Seven (highest exponent)

If a quintic polynomial with real coefficients has roots 3, -4, 1/2, and 9i as a root, what else must be a root, and why?

-9i because i is the square root of -1, always positive and negative square root

Write in logarithmic form

$F^G = D$

$\log_F(D) = G$

Rewrite with only positive integer exponents

$$\frac{q^4}{q(6r^2)^{-2}}$$

$$q^3 \cdot 36r^4$$

$$\boxed{36q^3r^4}$$

Write in exponential

$\log_4 m = n$

$$4^n = m$$

Factor $15x^3 - 3x^2 + 25x - 5$

$3x^2(5x - 1) + 5(5x - 1)$

$(3x^2 + 5)(5x - 1)$

Write the factored form of the polynomial with roots
2i, 3(M.2), 1/2, and 0(M.4)

$x^4(x - 2i)(x + 2i)(x - 3)^2(2x - 1)$

What type(s) of factoring could be used to factor

$2x^3 + 54$

GCF

Sum of Cubes

Determine the inverse of the relation:

{(0, -1), (-2, -3), (4, 5)}

{(-1, 0), (-3, -2), (5, 4)}

Condense $\log_9 85 - \log_9 17$

$\log_9(5)$

$A = Pe^{rt}$

A is the total accumulated amount, P is the initial/principal amount, r is the rate as a decimal, and t is the number of years

Determine the annual interest rate if Brian deposited $7000 into an account and after one year had a total investment of $7310.28. Round to the nearest whole percent.

A: 7310.28 P: 7000

r: unknown t: 1

$$7310.28 = 7000e^r$$

$$\frac{7310.28}{7000} = e^r$$

$$\ln\left(\frac{7310.28}{7000}\right) = r\ln(e)$$

$$r = \ln\left(\frac{7310.28}{7000}\right) \approx 4.337\%$$

Solve $\log(3 + 2x) = 2$

$10^2 = 3 + 2x$

$100 = 3 + 2x$

$97 = 2x$

$x = 97/2$

State the possible rational roots of

$2x^3 - 3x^2 + 8x - 6 = 0$

+/-1, +/-2, +/-3, +/-6,

+/- one half, +/- three-halves

*factors of constant / factors of leading coefficient

Determine the remainder:

$3x^3 - 2x + 4$ divided by $(x - 3)$

79

Simplify

$$(64x^{12}y^{10}z^{3})^{2/3}$$

$4^2x^8y^6z^2 * \sqrt[3]{y^2}$

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

$8^{-2/3} = 2^{-2} = \mathbf{1/4}$

Write a natural log expression that is equivalent to the value of x.

$17e^{5x} = 51$

$e^{5x} = 3$

$5x\ln e = \ln 3$

$5x = \ln 3$

$x = (\ln 3)/5$

An item that cost $5500 in 1993 depreciated at a rate of 20% per year. How much was the item worth after 9 years?

Use the exponential decay formula $A = A_0(1 - r)^t$.

$A = 5500(.80)^9$

$A = \$738.20$

Evaluate $\log_8(1/64)$

$8^x = 1/64$

x = -2

Solve $\log_3 x + \log_3(x + 1) = 2$

$\log_3(x^2 + x) = 2$

$3^2 = x^2 + x$

$x^2 + x - 9 = 0$

$x = \frac{-1 + \sqrt{37}}{2}$

Write the standard form of the polynomial whose roots are -1, -2 and 3

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

$= x^3 - 7x - 6$