40) $\sqrt[4]{x+2} + 9 = 14$ Domain: $x+2>0 \Rightarrow x>-2$

Solve by isolating radical

$\sqrt[4]{x+2} = 5$ Raise both sides to power of 4

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

$x+2 = 625$

$x = 623$ in domain ✓

41) $4x^2 - 12x + 9 = 0$ b^2-4ac describes the nature of the roots.

$(-12)^2 - 4(4)(9)$

$144 - 16(9)$

$144 - 144$

$0 \Rightarrow$ 1 real root; 1 x-intercept.
graph "bounces" on the x-axis.

42) $\sum_{0}^{5} 2n!$ Recall $n! = n \cdot (n-1) \cdot (n-2) \cdot \cdots \cdot 1$

Ex: $6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
and $0! = 1$ (by definition)

$= 2(0!) + 2(1!) + 2(2!) + 2(3!) + 2(4!) + 2(5!)$

$= 2(1) + 2(1) + 2(2) + 2(6) + 2(24) + 2(120)$

$= 2 + 2 + 4 + 12 + 48 + 240 = 308$

43) $\dfrac{8}{2x+4} - \dfrac{3x+1}{4x^2-16} = \dfrac{2}{x+2}$ Domain: all real numbers except ± 2

can't have zero in any denominator.

$2x+4=0$	$4x^2-16=0$	$x+2=0$
$2x=-4$	$4x^2=16$	$x=-2$
$x=-2$	$x^2=4$	
	$x=\pm 2$	

$\Rightarrow$ cont'd on next page for solving

43) (cont'd)

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

factor all denominators to find LCD

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

Multiply each term by LCD: $4(x+2)(x-2)$

$$4(x+2)(x-2)\left[\frac{8}{2(x+2)} - \frac{(3x+1)}{4(x+2)(x-2)} = \frac{2}{(x+2)}\right]$$

$$2(x-2)(8) - (3x+1) = 4(x-2)(2)$$

$$16x - 32 - 3x - 1 = 8x - 16$$

$$13x - 33 = 8x - 16$$
$$-8x \qquad\qquad -8x$$

$$5x - 33 = -16$$
$$+33 \qquad +33$$

$$5x = 17$$

$$x = \frac{17}{5}$$ in domain ✓

44) $5, 15, 45, 125, \ldots$

$15 - 5 = 10$

$45 - 15 = 30$ no arithmetic

$\frac{15}{5} = 3 \quad \frac{45}{15} = 3 \quad \frac{125}{45} \neq 3$ not geometric

so, neither.

45) Possible Rational Roots: $\frac{p}{q}$ where p is a factor of the constant term, and q is a factor of the lead coefficient.

$x^4 - 2x^3 - 10x^2 + 14x + 21$

$$\frac{p}{q} \Rightarrow \frac{\pm 1, \pm 21, \pm 3, \pm 7}{\pm 1} \Rightarrow \pm 1, \pm 3, \pm 7, \pm 21$$

$\Rightarrow$ cont'd

45) (cont'd)
Try each with synthetic substitution. If any work, continue factoring depressed (remaining) polynomial.

Try 1:

$$\begin{array}{r|rrrrr} 1 & 1 & -2 & -10 & 14 & 21 \\ & & 1 & -1 & -11 & 3 \\ \hline & 1 & -1 & -11 & 3 & \times \end{array}$$

Try −1:

$$\begin{array}{r|rrrrr} -1 & 1 & -2 & -10 & 14 & 21 \\ & & -1 & 3 & 7 & -21 \\ \hline & 1 & -3 & -7 & 21 & 0 \checkmark \end{array}$$

$x=-1$ is a zero so $x+1$ is a factor

$(x+1)(x^3-3x^2-7x+21)$ Factor:

	x	-3
x^2	x^3	$-3x^2$
-7	$-7x$	21

$(x+1)(x^2-7)(x-3)$

$(x+1)(x+\sqrt{7})(x-\sqrt{7})(x-3)$

46) $(15-10x^3-2x^2+x)-(7x-x^2)$ Distribute

$15-10x^3-2x^2+x-7x+x^2$ Combine like terms

$15-10x^3-x^2-6x$ (or $-10x^3-x^2-6x+15$)

47) $2\log 9+5\log\sqrt[3]{x}-\log\frac{1}{3}$

$\log 9^2+\log(\sqrt[3]{x})^5-\log\frac{1}{3}$

$\log\dfrac{81\sqrt[3]{x^5}}{\frac{1}{3}}$

$\log 243\sqrt[3]{x^5}$

48)
a) $10^{0.12}\approx 1.318$ Same as equation, rewrite as logarithm

$\log_{10}1.318\approx 0.12$

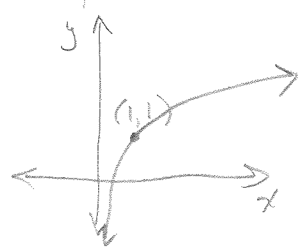
b) $e^{4.183}\approx 65.562$

$\ln 65.562\approx 4.183$

49) $f(x) = 1 + \log_7 x$ PF: $f(x) = \log_7 x$

Shifts up 1

Reference Point: $(1,0) \Rightarrow (1,1)$
parent one point on the graph



50) $\sqrt[3]{270} + 2\sqrt[3]{10}$ Need like radicals to combine.

$\sqrt[3]{27 \cdot 10} + 2\sqrt[3]{10}$

$\sqrt[3]{27} \cdot \sqrt[3]{10} + 2\sqrt[3]{10}$

$3\sqrt[3]{10} + 2\sqrt[3]{10}$

$5\sqrt[3]{10}$

51) $f(x) = -3x + 5$, $f^{-1}(x) = ?$ Rewrite as $y = f(x)$; switch x & y, solve for y.

$y = -3x + 5$

$x = -3y + 5$

$x - 5 = -3y$

$\frac{x-5}{-3} = y \Rightarrow f^{-1}(x) = \frac{x-5}{-3}$

52) $f(g(x)) = g(f(x)) \Rightarrow$ functions are inverse

so $f(g(x)) = x$ so $f(g(28)) = 28$.

53) Domain: Set of inputs: $\{3, 4, 7\}$

Range: Set of outputs: $\{-1, 0, 1, 2\}$

Not a function because inputs repeat.

54) $g(x) = -x^2 - 2x + 3$

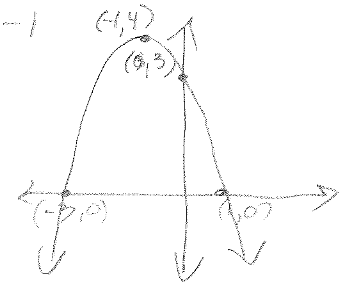
Vertex x at $x = \frac{-b}{2a} = \frac{-(-2)}{2(-1)} = \frac{2}{-2} = -1$

Vertex y at $g(-1) = -(-1)^2 - 2(-1) + 3 = -1 + 2 + 3 = 4$

Vertex at $(-1, 4)$; opens down; max $= 4$

y-intercept $= g(0) = -0^2 - 2(0) + 3 = 3$ $(0,3)$

axis of symmetry $\Rightarrow$ $x = -1$



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

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

$(x+3)(x-1) = 0$

$x = -3$ or $x = 1$ zeros: $(-3,0), (1,0)$

55) $\begin{cases} -9x + 5y = 1 \\ 3x - 2y = 2 \end{cases}$

multiply both equations to get opposite coefficients for one variable, then use linear combinations

$3(3x - 2y = 2)$

$9x - 6y = 6$

$-9x + 5y = 1$

$-y = 7$

$y = -7$ substitute to get x:

$-9x + 5(-7) = 1$

$-9x - 35 = 1$

$-9x = 36$

$x = -4$

$(-4, -7)$

Check $3(-4) - 2(-7) = 2$

$-12 + 14 = 2$

$2 = 2$ ✓

56) Direct variation model: $y = kx$

When $x = 2$, $y = 5$ so $5 = k(2) \Rightarrow k = \frac{5}{2}$

so $y = \frac{5}{2}x$

(alternately, $x = \frac{2}{5}y$)