① $\frac{3a^5b^7}{a-5b} \cdot \frac{2a-10b}{12a^4b^{10}}$

$\frac{3a^5b^7}{(a-5b)} \cdot \frac{2(a-5b)}{12a^4b^{10}}$

$\frac{(3)a^{5-4}b^{7-10}(2)}{(3)(2)(2)}$

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

$\frac{x^3-64}{16x-x^3} \cdot \frac{2x^2+8x+32}{x^2+2x-8}$

factor all

$\frac{(x-4)(x^2+4x+16)}{-x(x^2-16)} \cdot \frac{2(x^2+4x+16)}{x^2+2x-8}$

$\frac{(x-4)(x^2+4x+16)(2)(x^2+4x+16)}{-(x-4)(x+4)(x-2)(x+4)}$

$\frac{2(x^2+4x+16)^2}{(x+4)^2(x-2)}$

② $(2-5i)(8+2i)$

$16+4i-40i-10i^2$

$16-36i+10$

$26-36i$

$(3-7i)^2$

$9-42i+49i^2$

$9-42i-49$

$-40-42i$

③ $6x^2+11x-10=0$

$6x^2+15x-4x-10=0$

$3x(2x+5)-2(2x+5)=0$

$(3x-2)(2x+5)=0$

$3x-2=0 \quad 2x+5=0$

$3x=2 \quad 2x=-5$

$x=2/3 \quad x=-5/2$

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

$3x^2-2x=8$

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

$3x^2-6x+4x-8=0$

$3x(x-2)+4(x-2)=0$

$(3x+4)(x-2)=0$

$3x=-4 \quad x=2$

$x=-4/3$

$\{-4/3, 2\}$

8) $x^2+3x+\_\_\_\_ \quad (\frac{b}{2})^2=(\frac{3}{2})^2$

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

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

4) $\sqrt{3x+18}=x$

$3x+18=x^2$

$x^2-3x-18=0$

$(x-6)(x+3)=0$

$x=6 \quad x=-3$

$x=6 \quad x=-3$ ✓ ✓

$x-13\sqrt{x}+40=0 \qquad a=\sqrt{x}$

$a^2-13a+40=0$

$(a-5)(a-8)=0$

$(\sqrt{x}-5)(\sqrt{x}-8)=0$

$\sqrt{x}=5 \quad \sqrt{x}=8$

$x=25 \quad x=64$

6) $(x-7)(x+3) \leq 0$

boundary at $-3, 7$

test $-4 \quad 0 \quad 8$

$(-4-7)(-4+3) \leq 0$

$(-11)(-1) \leq 0$ X

$(0-7)(0+3) \leq 0$

$(-7)(3) \leq 0$

$-21 \leq 0$ ✓

$(8-7)(8+3) \leq 0$

$(1)(11) \leq 0$ X

only valid RANGE is

$[-3, 7]$

$x^2+5x+4 > 0$

$(x+1)(x+4) > 0$

boundary at $-4, -1$

test $-5, -2, 0$

$(-5+1)(-5+4) > 0$

$(-4)(-1) > 0$

$4 > 0$ ✓

$(-2+1)(-2+4) > 0$

$(-1)(2) > 0$

$-2 > 0$ X

$(0+1)(0+4) > 0$

$1(4) > 0$ ✓

$(-\infty, -4) \cup (-1, \infty)$

$x^2-5x+4 > 0$

$(x-4)(x-1) > 0$

boundary $1, 4$

Test $0, 2, 5$

$0^2-5(0)+4 > 0$ ✓

$(2)^2-5(2)+4 > 0$

$4-10+4 > 0$ X

$5^2-5(5)+4 > 0$

$4 > 0$ ✓

$(-\infty, 1) \cup (4, \infty)$

$|2(x-1)+4| \leq 8$

$-8 \leq 2(x-1)+4 \leq 8$

$-12 \leq 2(x-1) \leq 4$

$-6 \leq x-1 \leq 2$

$-5 \leq x \leq 3$

$[-5, 3]$

$|2x+3| \leq 15$

$-15 \leq 2x+3 \leq 15$

$-18 \leq 2x \leq 12$

$-9 \leq x \leq 6$

$|2x+5|-7 > -6$

$|2x+5| > 1$

$2x+5 < -1$ $\quad$ $2x+5 > 1$

$2x < -6$ $\quad$ $2x > -4$

$x < -3$ $\quad$ $x > -2$

$\left|\frac{2x+6}{3}\right| > 2$

$-\frac{2x+6}{3} < -2$ $\quad$ $\frac{2x+6}{3} > 2$

$2x+6 < -6$ $\quad$ $2x+6 > 6$

$2x < -12$ $\quad$ $2x > 0$

$x < -6$ $\quad$ $x > 0$

$|2x+5|-7 \geq -6$

$|2x+5| \geq 1$

$2x+5 \leq -1$ $\quad$ $2x+5 \geq 1$

$2x \leq -6$ $\quad$ $2x \geq -4$

$x \leq -3$ $\quad$ $x \geq -2$

Distance

$(4,-1), (-6,3)$ $\quad$ $(-2,-6), (-3,4)$

$$d = \sqrt{(y_2-y_1)^2 + (x_2-x_1)^2}$$

$d = \sqrt{(3-(-1))^2 + (-6-4)^2}$

$= \sqrt{4^2 + (-10)^2}$

$= \sqrt{116} = \sqrt{4}\sqrt{29} = 2\sqrt{29}$

$d = \sqrt{(4-(-6))^2 + (-3-(-2))^2}$

$d = \sqrt{10^2 + (-1)^2}$

$= \sqrt{101}$

Mid Point

$(6,8), (2,4)$ $\quad$ $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ $\quad$ $(-2,-8), (-6,-2)$

$\left(\frac{6+2}{2}, \frac{8+4}{2}\right)$ $\quad$ $\left(\frac{-2-6}{2}, \frac{-8-2}{2}\right)$

$\left(\frac{8}{2}, \frac{12}{2}\right) = (4,6)$ $\quad$ $\left(-\frac{8}{2}, \frac{-10}{2}\right) = (-4,-5)$

$(-3,-4)(6,-8)$

$\left(\frac{-3+6}{2}, \frac{-4-8}{2}\right)$

$\left(\frac{3}{2}, \frac{-12}{2}\right)$

$\left(\frac{3}{2}, -6\right)$

even or odd: replace x with $-x$ → same equation = even
$-f(x)$ = odd

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

odd

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

neither

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

even

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

even

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

even

$g(x) = x\sqrt{-x^2}$
$g(-x) = -x\sqrt{-(-x)^2}$
$= -x\sqrt{-x^2}$

odd

Circle $(x-h)^2 + (y-k)^2 = r^2$

12) $(3,-4)$ $r=6$

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

$(0,0)$, $r=4$

$(x-0)^2 + (y-0)^2 = 4^2$
$x^2 + y^2 = 16$

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

$f(-1) = (-1)^2 + 2(-1) + 3$
$= 1 - 2 + 3$
$= 2$

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

$f(x+5) = (x+5)^2 + 2(x+5) + 3$
$= x^2 + 10x + 25 + 2x + 10 + 3$
$= x^2 + 12x + 38$

14) Write equation given shifts & reflections

x^2, right 2

$f(x) = (x-2)^2$ (or Right 2)

x^2, Left 2 up 1 reflect over x axis

$(x+2)^2$ Left 2
$(x+2)^2 + 1$ up 1

$f(x) = -(x+2)^2 - 1$ reflect over x

$\sqrt{x}$ shifted Left 3

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

$\sqrt{x}$ shifted left 1 down 4

$\sqrt{x+1} - 4 = f(x)$

15) $f(x) = 4x - 3$ $g(x) = 5x^2 - 2$

$(f \circ g)(x)$
$f(g(x)) = 4(5x^2 - 2) - 3$
$= 20x^2 - 8 - 3$
$= 20x^2 - 11$

$(g \circ f)(2)$
$g(f(2))$

$f(2) = 4(2) - 3$
$= 5$

$g(5) = 5(5)^2 - 3$
$= 5(25) - 2$
$= 123$

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

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

$(g \circ f)(2)$
$g(f(2)) = (2^2 + 2)^2 - 2$
$= (4+2)^2 - 2$
$= 36 - 2$
$= 34$

16) $f(x) = \frac{7}{x} - 3$ find $f^{-1}(x)$

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

$y = \frac{7}{x} - 3$

$x = \frac{7}{y} - 3$

$x + 3 = \frac{7}{y}$

$y(x+3) = 7$

$y = \frac{7}{x+3}$

are $3x - 7 = f(x)$ $g(x) = \frac{x+7}{3}$ inverses

$(f \circ g)(x) = 3\left(\frac{x+7}{3}\right) - 7$

$= x + 7 - 7$

$= x$

$(g \circ f)(x) = \frac{(3x-7)+7}{3}$

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

$(f \circ g)(x) = (g \circ f)(x) = x$ INVERSES

17) Vertex $(x-h)^2 + k$ form

$f(x) = 2(x-3)^2 - 1$

$(3, -1)$

$-2(x+1)^2 + 5 = g(x)$

$(-1, 5)$

$h(x) = 2x^2 - 8x + 3$

$-\frac{b}{2a} = -\frac{(-8)}{2(2)} = 2$

$h(2) = 2(2)^2 - 8(2) + 3$

$= -5$

$(2, -5)$

$-x^2 + 2x + 8 = k(x)$

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

$k(1) = -1 + 2 + 8 = 9$

$(1, 9)$

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

Leading coefficient x^2 is positive so

MINIMUM

$g(x) = -4x^2 + 8x - 3$

Leading coefficient is negative $(-4x^2)$ so

MAXIMUM

Evaluate

$\log_2 64$

$64 = 2^x$

$2^6 = 2^x$

$6 = x$

$\log_5 \frac{1}{5}$

$\frac{1}{5} = 5^x$

$5^{-1} = 5^x$

$x = -1$

Solve:

$2^{2x-1} = 32$

$2^{2x-1} = 2^5$

$2x - 1 = 5$

$2x = 6$

$x = 3$

$4^{2x-1} = 64$

$4^{2x-1} = 4^3$

$2x - 1 = 3$

$2x = 4$

$x = 2$

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

$P = \$50000$ $r = 7.5\%$

$n = 4$

$A = Pe^{rt}$

Triple Amount $\Rightarrow A = 3P$

$3P = P(1 + \frac{0.075}{4})^{4t}$

$3 = (1.01875)^{4t}$

$\ln 3 = 4t \ln(1.01875)$

$\frac{\ln 3}{4 \ln(1.01875)} = t$

14.78 years

$3P = Pe^{0.075t}$

$3 = e^{0.075t}$

$\ln 3 = \ln(e^{0.075t})$

$\ln 3 = 0.075t \ln e$

$\frac{\ln 3}{0.075} = t$

$14.64 \text{ years} = t$

23) $\frac{1}{2} = \log_{49} 7$

$49^{\frac{1}{2}} = 7$

$3 = \log_4 x$

$4^3 = x$

$x = 64$

$\log_3 81 = y$

$3^4 = 81$

$y = 4$

You don't have to solve, but...

23) 1ST LS NOT 2ND LS x can't be negative

24) $2\ln x + \frac{1}{3}\ln(x+5)$

$\ln x^2 + \ln (x+5)^{1/3}$

$\ln\left[x^2\sqrt[3]{x+5}\right]$

$\frac{1}{4}\log_b x - 2\log_b 5 - 10\log_b y$

$\frac{1}{4}\log_b x - [2\log_b 5 + 10\log_b y]$

$\frac{1}{4}\log_b x - [\log_b 25 + \log_b y^{10}]$

$\frac{1}{4}\log_b x - [\log_b [25y^{10}]]$

$\log_b x^{1/4} - \log_b [25y^{10}]$

$\log_b \left[\frac{\sqrt[4]{x}}{25y^{10}}\right]$

Use change of base

$\log_5 13 =$

$\frac{\log 13}{\log 5} \approx 1.5937$

$\log_{0.1} 17 =$

$\frac{\ln 17}{\ln 0.1} \approx -1.2304$

Solve

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

solution available MONDAY, email me with solution by NOON MONDAY for EXTRA CREDIT

$5^x = 17$

$\ln 5^x = \ln 17$

$x \ln 5 = \ln 17$

$x = \frac{\ln 17}{\ln 5} \approx 1.7604$

OR

$\log_5 17 = x$. WRITE AS A LOG USE CHANGE OF BASE

$\frac{\log 17}{\log 5} = 1.7604$

$7^{x+2} = 410$

$\ln(7^{x+2}) = \ln 410$

$(x+2)\ln 7 = \ln 410$

$x\ln 7 + 2\ln 7 = \ln 410$

$x\ln 7 = \ln 410 - 2\ln 7$

$\therefore x = \frac{\ln 410}{\ln 7} - \frac{2\ln 7}{\ln 7}$

$x = \frac{\ln 410}{\ln 7} - 2 \approx 1.0917$

Solve: $\log_2(x-2) - \log_2(x-5) = 3$

$\log_2\left[\frac{x-2}{x-5}\right] = 3$

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

$\frac{x-2}{x-5} = 8$

$x-2 = 8(x-5)$

$x-2 = 8x-40$

$x2 = 7x-40$

$38 = 7x$

$\frac{38}{7} = x$

Check it

$\log_2\left[\frac{\frac{38}{7} - \frac{14}{7}}{\frac{38}{7} - \frac{35}{7}}\right] = 3$

$\log_2 \frac{\frac{24}{7}}{\frac{3}{7}} = \log_2 8 = 3$ ✓