Do Now

① Evaluate: $\ln e^{-2} + \log_2 64 + \log_3 \frac{1}{81} + \ln e + \log_4 \frac{1}{16}$

$-2 + 6 - 4 + 1 - 2$

-1

② Solve for x: $(\ln x - 4)^3 - (\ln x - 4) = -3(\ln x - 4)^2 + 3$

let $y = x - 4$

$y^3 - y = -3y^2 + 3$

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

$y^2(y+3) - (y+3) = 0$

$(y^2 - 1)(y+3) = 0$

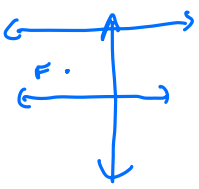
$y = \pm 1 \quad y = -3$

$\ln x - 4 = 1$, $\ln x = 5$, $x = e^5$

$\ln x - 4 = -1$, $\ln x = 3$, $x = e^3$

$\ln x - 4 = -3$, $\ln x = 1$, $x = e$

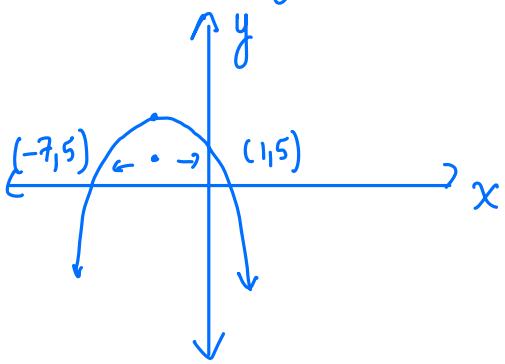
③ Write an equation for the parabola whose focus is $(-3, 5)$ and whose directrix is $y = 9$. Then sketch it using a minimum of 3 points.



vertex: $(-3, 7)$

$p = -2$

$(x+3)^2 = -8(y-7)$



④ What are the coordinates of the focus and the equation of the directrix of the parabola whose equation is

$4p(y-k) = (x-h)^2$

$-\frac{1}{4}(y-13) = (x+2)^2$

$4p = -\frac{1}{4}$

$16p = -1$

$p = -\frac{1}{16}$

directrix: $y = 13 + \frac{1}{16}$

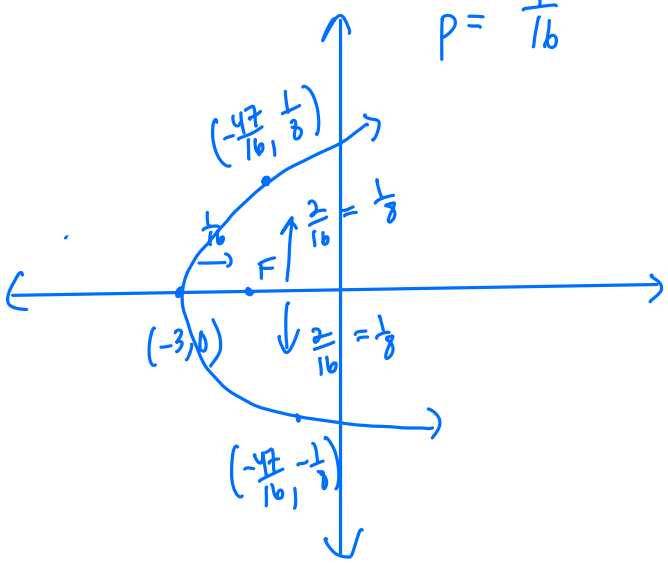
vertex: $(-2, 13)$

focus: $(-2, 13 - \frac{1}{16})$

⑤ Find the equation of the parabola whose vertex is $(-3, 0)$ and whose focus is $(-\frac{47}{16}, 0)$, then sketch the graph.

$(-\frac{48}{16}, 0)$

$p = \frac{1}{16}$



$4p \rightarrow 4(\frac{1}{16})$

$\frac{1}{4}(x+3) = (y-0)^2$

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

$x \geq -\frac{2}{3}$, $x \geq 1$

⑥ Solve for x using restriction sets:

$$\sqrt{3x+2} = 3 - \sqrt{x-1}$$

$-2x+4 \geq 0$
$4 \geq 2x$
$2 \geq x$
$x \leq 2$

$$\left(\sqrt{3x+2} + \sqrt{x-1}\right)^2 = (3)^2$$

$$3x+2+x-1+2\sqrt{3x^2-x-2} = 9$$

$$2\sqrt{3x^2-x-2} = -4x+8$$

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

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

$$0 = x^2-15x+18$$

$$x = \frac{15 \pm \sqrt{(15)^2-4(1)(18)}}{2(1)} = \frac{15 \pm \sqrt{153}}{2}$$

$\frac{15+\sqrt{153}}{2}$ or $\frac{15-\sqrt{153}}{2}$

final restrictions:

$[1, 2]$

⑦ Solve for x using restriction sets:

$$\left(\sqrt{2x-5}\right)^2 = (3-x)^2$$

$x \geq \frac{5}{2}$

$3-x \geq 0$
$3 \geq x$
$x \leq 3$

$$2x-5 = x^2-6x+9$$

$$0 = x^2-8x+14$$

$$x = \frac{8 \pm \sqrt{64-4(1)(14)}}{2(1)}$$

final restrictions:

$\left[\frac{5}{2}, 3\right]$

$$x = \frac{8 \pm \sqrt{8}}{2} = \frac{8 \pm 2\sqrt{2}}{2} = 4 \pm \sqrt{2}$$

$4-\sqrt{2}$

Homework 03-21

Name: _____ Date: _____

PCH: Mixed Log Practice Ms. Loughran

$e^? = 1$ $3^? = 3^{\frac{1}{2}}$ $10^? = \frac{1}{100}$ $e^? = e$ $4^? = \frac{1}{4}$ $2^? = 64$

1. Evaluate: $\ln 1 + \log_3 \sqrt{3} - \log(0.01) + \ln e + \log_4\left(\frac{1}{4}\right) - \log_2 64$

$0 + \frac{1}{2} - (-2) + 1 - 1 - 6$

$0 + \frac{1}{2} + 2 + 1 - 1 - 6$

$\frac{1}{2} - 4$ or $-\frac{7}{2}$

2. Find the domain of $y = \ln(x-7) + 2$ → shifts lnx right 7 ↑ 2

$x - 7 > 0$

$x > 7$

or

$(7, \infty)$

3. Solve: $\log_4(2x+3) = 2 + 2\log_4 x$

$\log_4(2x+3) = \log_4 16 + \log_4 x^2$

$\log_4 16x^2$

$\log_4(2x+3) - 2\log_4 x = 2$

$\log_4 \frac{2x+3}{x^2} = 2$

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

$16x^2 = 2x + 3$

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

$16x^2 - 8x + 6x - 3 = 0$

$8x(2x-1) + 3(2x-1) = 0$

$(8x+3)(2x-1) = 0$

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

4. Evaluate: $\log_9(\log_3(\log_4 x)) = \frac{1}{2}$

$9^{\frac{1}{2}} = \log_3(\log_4 x)$

$3 = \log_3(\log_4 x)$

$3^3 = \log_4 x$

$27 = \log_4 x$

$x = 4^{27}$

5. Evaluate: $(\log_{32} 25)(\log_5 8)$

$$\frac{\log 25}{\log 32} \cdot \frac{\log 8}{\log 5}$$

$$\frac{2\log 5}{5\log 2} \cdot \frac{3\log 2}{\log 5} = \frac{6}{5}$$

6. Solve: $(\ln x - 3)^2 - 2(\ln x - 3) - 8 = 0$

let $r = \ln x - 3$

$r^2 - 2r - 8 = 0$

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

$r = 4$ $\quad$ $r = -2$

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

$\ln x = 7$ $\quad$ $\ln x = 1$

$x = e^7$ $\quad$ $x = e$

7. Simplify: $20e^{4\ln\left(\frac{1}{2}\right)}$

$e^{\ln \text{stuff}} = \text{stuff}$

$\ln e^{\text{stuff}} = \text{stuff}$

$20e^{\ln\left(\frac{1}{2}\right)^4}$

$20e^{\ln \frac{1}{16}}$

$20\left(\frac{1}{16}\right) = \frac{5}{4}$

8. Solve: $\ln(x^2 + 4x) - \ln 5 = 0$

$\ln(x^2+4x) = \ln 5$

$x^2 + 4x = 5$

$\ln \frac{x^2+4x}{5} = 0$

$e^0 = \frac{x^2+4x}{5}$

$x^2 + 4x = 5$

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

$(x+5)(x-1) = 0$ or easier

$x = -5, 1$

9. Solve: $e^{7+4x} = 5$

$7 + 4x = \ln 5$

$4x = \ln(5) - 7$

$x = \frac{\ln(5) - 7}{4}$