Quiz Monday from Test 4 only.

$y = \boxed{2|x| - 1}$

$2y - x = 1$

$2(2|x|-1) - x = 1$

$4|x| - 2 - x = 1$

$+2 + x = +2 + x$

$4|x| = x+3$

$|x| = \frac{x+3}{4}$

$x = \frac{x+3}{4}$ OR $x = \frac{-x-3}{4}$

$4x = x+3$

$3x = 3$

$x = 1$

$4x = -x-3$

$5x = -3$

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

$x=1$:

$y = 2-1 = 1$ $(1,1)$

$2(1) - 1 = 1$ ✓

$x = -\frac{3}{5}$:

$y = 2\left|-\frac{3}{5}\right| - 1$ $\left(-\frac{3}{5}, \frac{1}{5}\right)$

$= \frac{6}{5} - \frac{5}{5} = \frac{1}{5}$

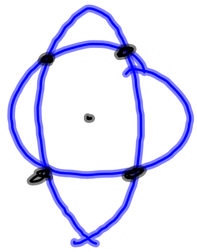
$2\left(\frac{1}{5}\right) - \left(-\frac{3}{5}\right) = 1$ ✓

$\boxed{\left\{(1,1), \left(-\frac{3}{5}, \frac{1}{5}\right)\right\}}$

A circle & an ellipse.

$$x^2+y^2=5$$

$$x^2+4y^2=+4$$



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

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

$$x^2+y^2=5$$

$$y^2 = 5-x^2$$

$$\sqrt{y^2} = \sqrt{5-x^2}$$

$$|y| = \sqrt{5-x^2}$$

$$\boxed{y = \pm\sqrt{5-x^2}}$$

So $x^2+4\left(\pm\sqrt{5-x^2}\right)^2=+4$

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

The negative drops out when we square it.

$$x^2+20-4x^2 = +4$$

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

$$x^2 = \frac{16}{3}$$

$$\sqrt{x^2} = \sqrt{\frac{16}{3}} = \frac{\sqrt{16}}{\sqrt{3}} = \frac{4}{\sqrt{3}}\cdot\frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$$

$$|x| = \frac{4\sqrt{3}}{3}$$

$$\boxed{x = \pm\frac{4\sqrt{3}}{3}}$$

Now, $y = \pm\sqrt{5-x^2} = \pm\sqrt{5-\left(\pm\frac{4\sqrt{3}}{3}\right)^2}$

$$= \pm\sqrt{5-\frac{16\cdot 3}{9}}$$

$$= \pm\sqrt{\frac{15}{3}-\frac{16}{3}} = \pm\sqrt{-\frac{1}{3}}$$ Not Real!

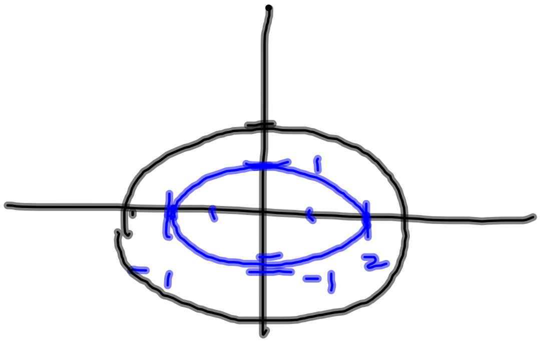
No Solution!

Teacher break

$x^2+y^2=5$

$x^2+4y^2=4$

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



Ellipse inside circle

$\boxed{\text{No touching.}}$

$x^2 + y^2 = 5 \Longrightarrow y = \pm\sqrt{5-x^2}$

$x^2 + 4y^2 = 14$

$x^2 + 4\left(\pm\sqrt{5-x^2}\right)^2 = 14$

$x^2 + 4(5-x^2) = 14$

$x^2 + 20 - 4x^2 = 14$

$-3x^2 = -6$

$x^2 = 2$

$x = \pm\sqrt{2}$

$y = \pm\sqrt{5-x^2}$

$= \pm\sqrt{5-(\pm\sqrt{2})^2}$

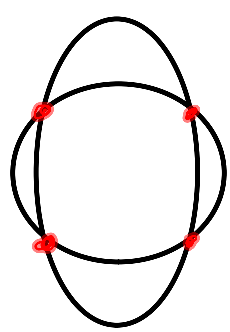
$= \pm\sqrt{5-2}$

$= \pm\sqrt{3}$

Sol'n Set:

$\{(\sqrt{2},\sqrt{3}), (\sqrt{2},-\sqrt{3}), (-\sqrt{2},\sqrt{3}), (-\sqrt{2},-\sqrt{3})\}$

$= \{(\pm\sqrt{2},\sqrt{3}), (\pm\sqrt{2},-\sqrt{3})\}$ is ok, too.



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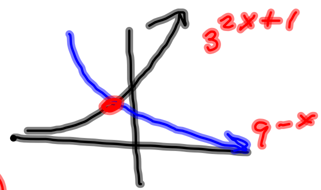
$y = 3^{2x+1}$

$y = 9^{-x} = (3^2)^{-x} = 3^{-2x}$



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

$2x+1 = -2x$

$4x = -1$

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

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

$y = 9^{-(-\frac{1}{4})} = 9^{\frac{1}{4}} =$

$= (3^2)^{\frac{1}{4}} = 3^{\frac{1}{2}} = \sqrt{3}$ ✓

$$\boxed{\left\{\left(-\frac{1}{4}, \sqrt{3}\right)\right\}}$$

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$y = \log(2x+4)$

$y = 1 + \log(x-2)$

$\log(2x+4) = \log(x-2) + 1$

$\log(2x+4) - \log(x-2) = 1$

$\log_{10}\left(\frac{2x+4}{x-2}\right) = 1$

10 10

$\frac{2x+4}{x-2} = 10$

$2x+4 = 10(x-2)$

$2x+4 = 10x - 20$

$-8x = -24$

$x = 3$

$\{(3,1)\}$

Leanne,
Nathan,
Mark,
Phillip

Brian had a good question. :)

$y = \log(2x+4)$

$= \log(2(3)+4)$

$= \log(10) = 1$

$(3,1)$

$y = \log(x-2)+1$

$= \log(3-2)+1$

$= \log(1)+1$

$= 0 + 1 = 1$ ✓

$$\log(2x+4) - \log(x-2) = 1$$

$$\log x - \log y = \log\left(\frac{x}{y}\right)$$

$$10^{\log\left(\frac{2x+1}{x-2}\right)} = 10^{1}$$

$$\frac{2x+1}{x-2} = 10$$

$$10^{\log(2x+4) - \log(x-2)} = 10^{1}$$

$$10^{\log(2x+4)} \cdot 10^{-\log(x-2)} = 10^{1}$$

$$\frac{10^{\log(2x+4)}}{10^{\log(x-2)}} = 10$$

$$\frac{2x+4}{x-2} = 10$$

$$\left.\begin{aligned} y &= 8^x \\ x &= \log_2(2y) \end{aligned}\right\} \quad y = 8^{\log_2(2y)}$$

$$\left.\begin{aligned} x &= \log_2(2\cdot 8^x) \\ 2y &= 2^x \end{aligned}\right\}$$ Two other routes.

$y = 2^{x-1}$

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

$$y = 8^{\log_2(2y)} = (2^3)^{\log_2(2y)} = 2^{3\log_2(2y)}$$

$$y = 2^{\log_2((2y)^3)} = (2y)^3 = 8y^3$$

Cassie's Way:

$$2^{x-1} = 8^x = 2^{3x}$$

$$x - 1 = 3x$$

$$-2x = 1$$

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

$$8y^3 = y$$

$$8y^3 - y = 0$$

$$y(8y^2 - 1)$$

$y = 0$ OR $8y^2 - 1 = 0$

$$y^2 = \frac{1}{8}$$

$$y = \pm\sqrt{\frac{1}{8}} = \pm\frac{1}{2\sqrt{2}} = \pm\frac{\sqrt{2}}{4}$$

$y = 0, -\frac{\sqrt{2}}{4}, +\frac{\sqrt{2}}{4}$

$\notin D$

$y = 0$: $\log_2(2y) \notin \mathbb{R}$

$y = -\frac{\sqrt{2}}{4}$: Bad

$y = +\frac{\sqrt{2}}{4}$:

$$x = \log_2(2y) = \log_2\left(\frac{\sqrt{2}}{2}\right) =$$

$$= \log_2(\sqrt{2}) - \log_2(2)$$

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

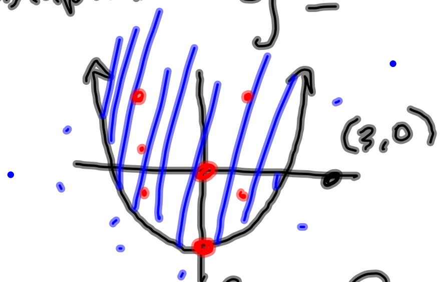
$$\boxed{\left\{\left(-\frac{1}{2}, \frac{\sqrt{2}}{4}\right)\right\}}$$

So we followed an inefficient path. Sometimes this is VERY good for sharpening skills: Arriving at the same result in different ways.

I suggest working them a couple ways.

$$y = x^2 - 2$$

Graph: $y \leq x^2 - 2$



Is $0 \leq 3^2 - 2$?

$0 \leq 7$? Yes

(0,0) good

want (x,y) under points on $y = x^2 - 2$

Test point:

(0,0)

Is $0 \leq 0 - 2$?

$0 \leq -2$? No

(0,0) BAD

Scratch out Bad stuff.

§5.5 #s 5, 7, 11, 23, 33, 37, 41, 45

Due Monday

I'll take questions on 5.3 on Friday.