MA141-004

Thursday, January 10

from RECITATION:

$$|x-6|<8$$

(1) $x-6<8 \Rightarrow x<14$

(2) $x-6>-8 \Rightarrow x>-2$

...... $(-2, 14)$

$\cancel{13.9}$

14

$13.9\overline{9}$

$$.\overline{9} = 1$$

proof: $.\overline{9} = x$

$9.9\overline{9} = 10x$

$$10x = 9.\overline{9}$$
$$-(\;x = .\overline{9}\;)$$
$$9x = 9$$
$$x = \frac{9}{9} = 1$$

$$.99\overline{9} + \epsilon = 1$$

$$\frac{1}{9} = .\overline{1}$$

$$\frac{2}{9} = .\overline{2}$$

$$\frac{3}{9} = .\overline{3}$$

$$.24\overline{9} = \frac{1}{4}$$

$$\vdots$$

$$\frac{8}{9} = .\overline{8}$$

$$1 = \frac{9}{9} = .\overline{9}$$

exponential & logarithmic forms:

$\longrightarrow\ 5^x = 18.7$

(LOG = EXPONENT)

$\Longrightarrow\ x = \log_5(18.7)$

$e^x = 15.2$ $\quad (e \approx 2.718)$

(natural exp.)

$$\lim_{k\to\infty}\left(1+\frac{1}{k}\right)^{k} = e$$

1^∞

$k = 100$

$\left(1+\frac{1}{100}\right)^{100} \approx 2.704$

$k = 10{,}000$

$\left(1+\frac{1}{10{,}000}\right)^{10{,}000} \approx 2.718$

$k = 100{,}000{,}000$

$\left(1+\frac{1}{100{,}000{,}000}\right)^{100{,}000{,}000} \approx 2.718$

$e^x = 15.2$

LOG VERSION =

$x = \boxed{\log_e}(15.2)$

$\rightarrow x = \ln_e(15.2)$

---

inverses:

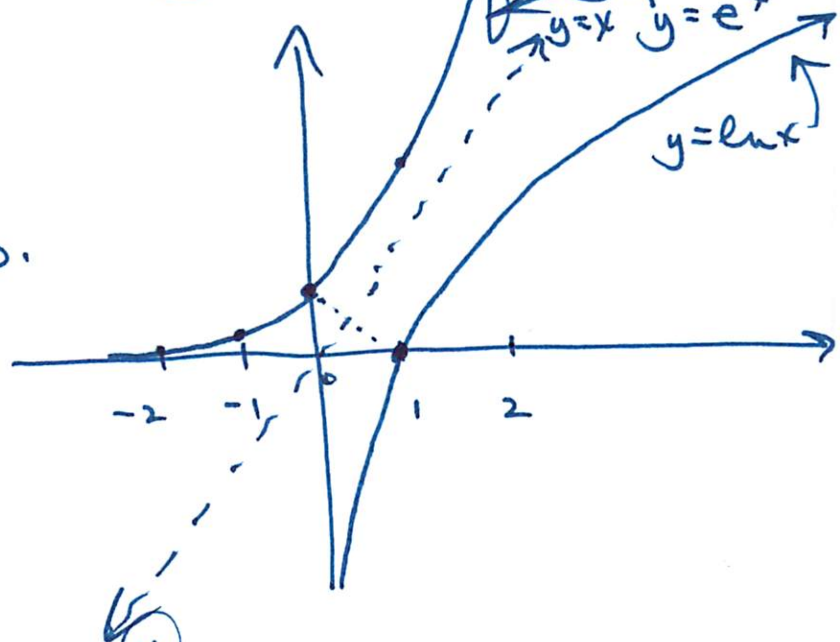
① interchange x & y

② solve for y:

$\boxed{y = e^x}$

mat app.

x	y
-2	$e^{-2} \approx .135$
-1	$e^{-1} \approx .368$
0	$e^0 = 1$
1	$e^1 \approx 2.718$
2	$e^2 \approx 7.389$



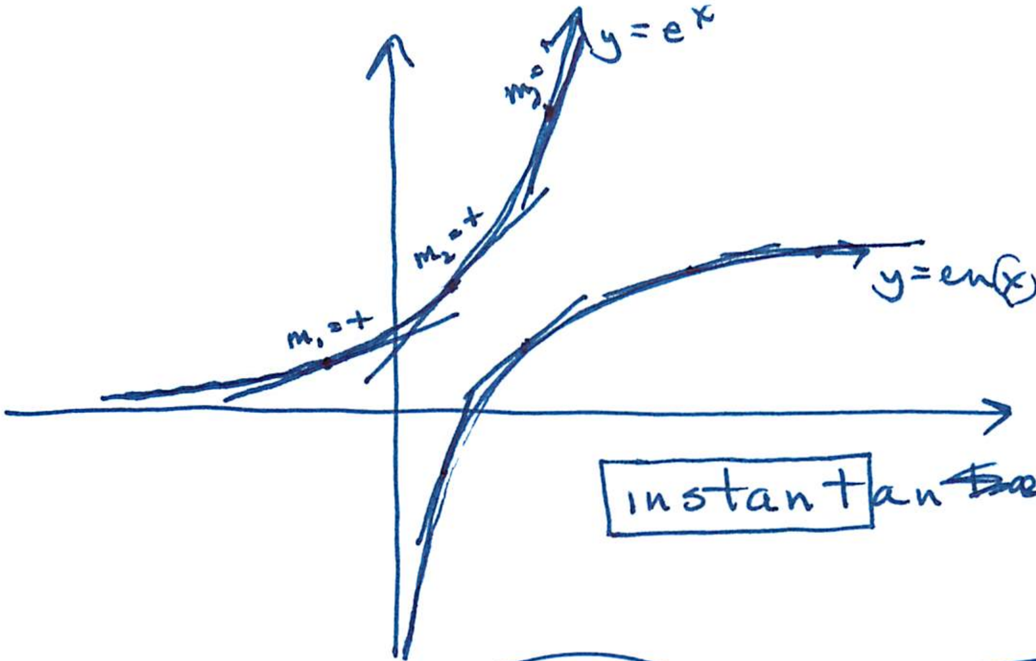
INV: $x = e^y$

solve for y:

$y = \log_e x$

$\boxed{y = \ln x}$

natural log

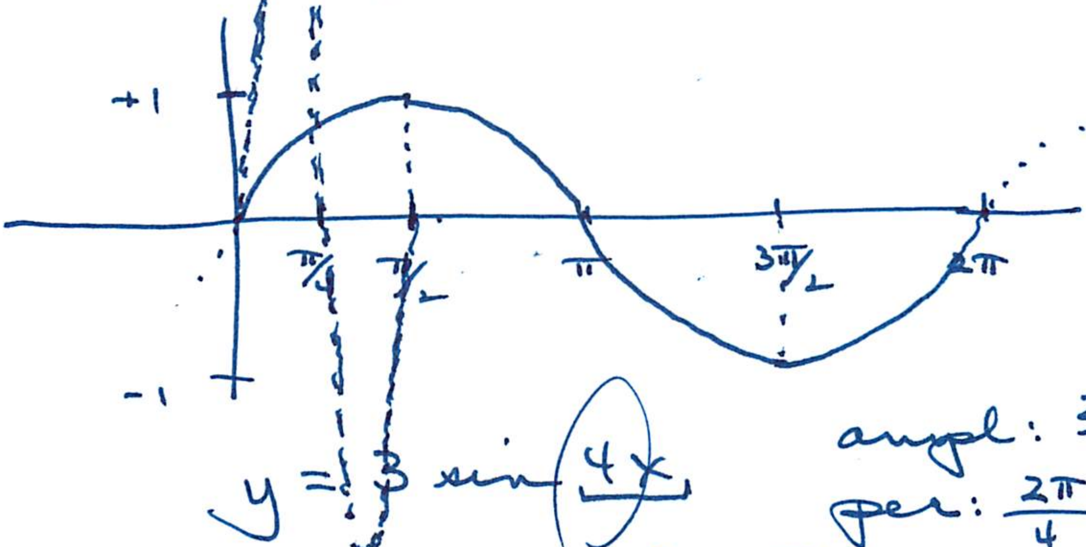


$\boxed{\text{instant}}$aneous

trig:

$y = \sin x$ period: 2π

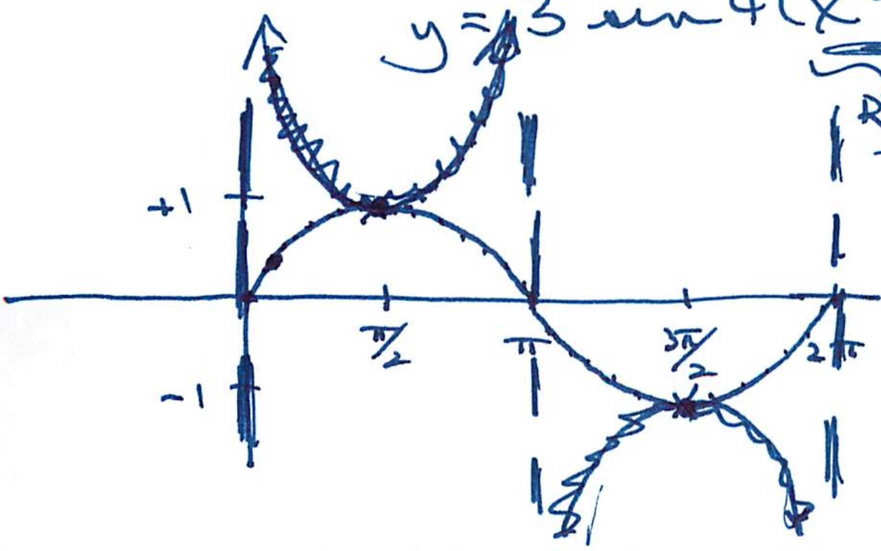
ampl: 1



$y = 3 \sin 4x$ ampl: 3

per: $\frac{2\pi}{4} = \frac{\pi}{2}$

$y = 3 \sin 4\underbrace{(x - \pi/3)}_{RT\ \pi/3}$



$y = \sin x$

$\boxed{y = \csc x} = \frac{1}{\sin x}$

$$\ln(-153.8) = \underline{\qquad\qquad}$$

$$e^{??} = -153.8$$

$$\left[\ \ln 8 = \underline{2.08}\ \right]$$

$$e^{2.08} = 8$$

$$e^{-2} = +$$

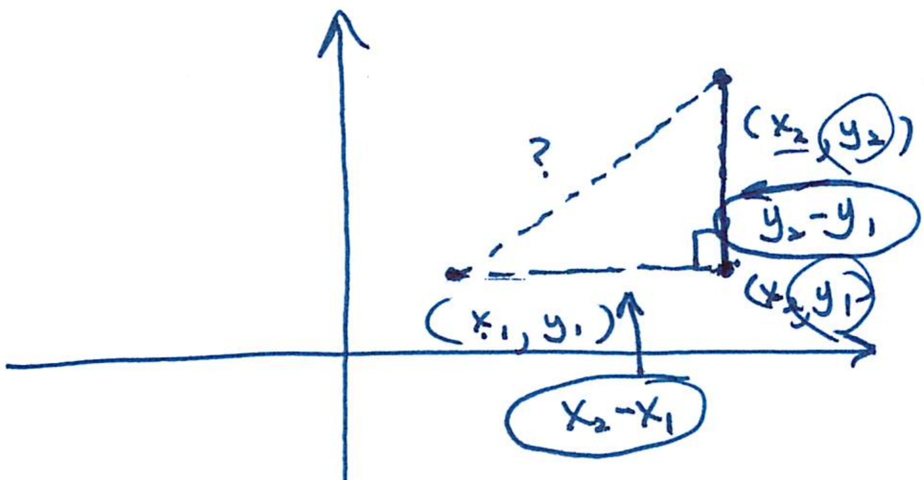
$$e^{0} = +$$

$$e^{2} = +$$

$$\ln(\underline{e^2}) = \underline{2}$$

$$e^{?} = e^{2}$$

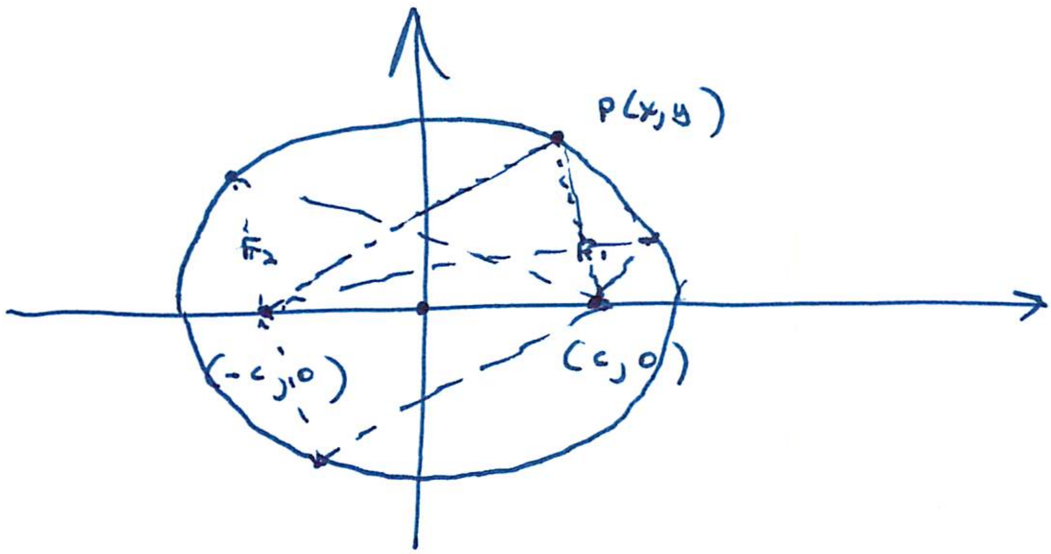
Cartesian Coord. Plane:



$$(?)^2 = (y_2-y_1)^2 + (x_2-x_1)^2$$

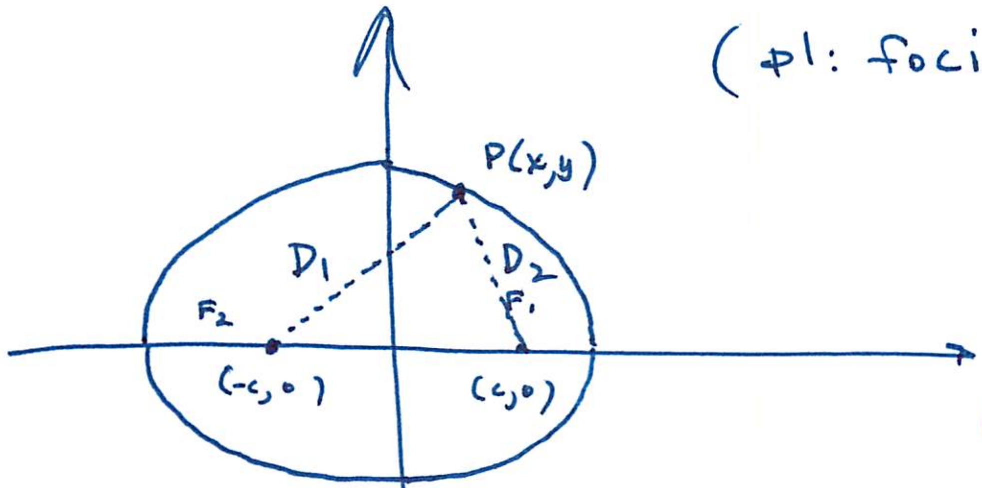
$$? = \sqrt{(y_2-y_1)^2 + (x_2-x_1)^2}$$

(DIST. FORMULA)



focus

(pl: foci)



$(a+b)^2 =$

a^2+2ab

$$D_1 = \sqrt{(x+c)^2+(y-0)^2}$$

$$D_2 = \sqrt{(x-c)^2+(y-0)^2}$$

$$\sqrt{(x+c)^2+y^2} + \sqrt{(x-c)^2+y^2} = 2a$$

$$\left(\sqrt{(x+c)^2+y^2}\right)^2 = \left(2a - \sqrt{(x-c)^2+y^2}\right)^2$$

$$(x+c)^2+y^2 = 4a^2 - 4a\sqrt{(x-c)^2+y^2} + (x-c)^2+y^2$$

$$\vdots$$

⋮

$$\frac{x^2}{a^2} + \frac{y^2}{a^2 - c^2} = 1$$

$$a^2 - c^2 = b^2$$

$$\boxed{(a^2 = b^2 + c^2)}$$

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

ellipse

$y = 0$

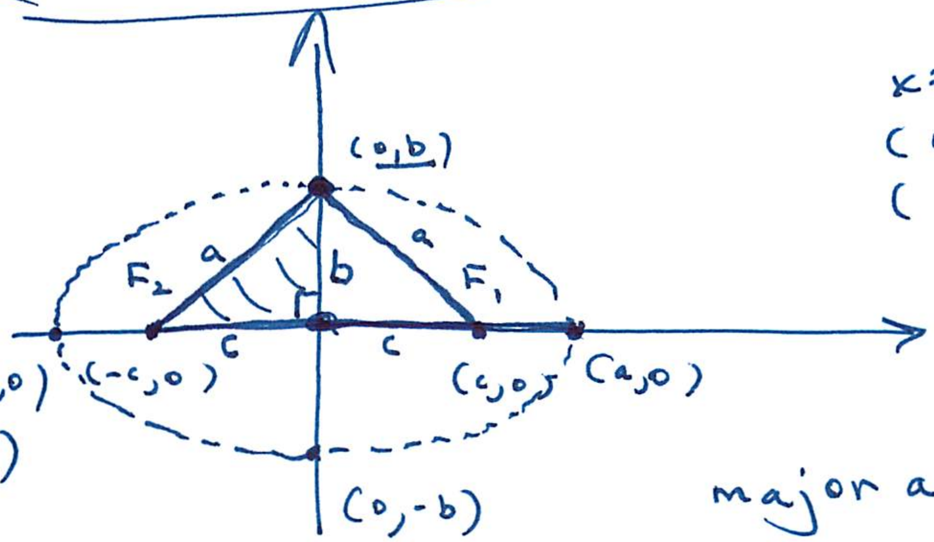
$(a, 0)$

$(-a, 0)$

$x = 0$

$(0, b)$

$(0, -b)$



center: $(0,0)$

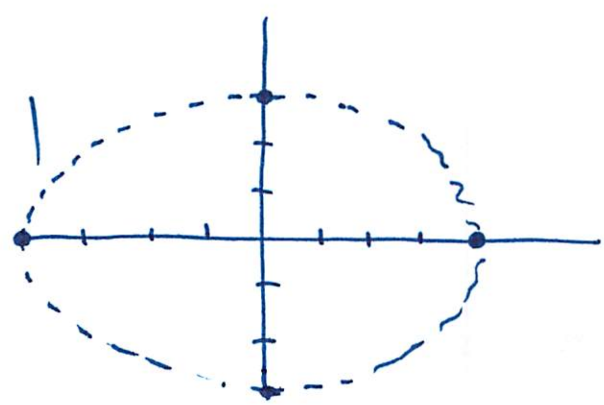
minor axis: ON the y-axis

major axis: ON the x-axis

$$\frac{x^2}{16} + \frac{y^2}{9} = 1$$

$16 \to a^2$, $a = 4$

$9 \to b^2$, $b = 3$



Recall: A **set**, $\mathcal{S}$, is a collection of objects. The notation "$x \in \mathcal{S}$ " means that x is an element of $\mathcal{S}$. Sets are often denoted in following three ways: set builder notation, roster method, and interval notation.

Sets can be combined using the **union** and **intersection** operations. We also consider **subsets** of sets.

1. Suppose $\mathcal{A} = [1, 8)$ and $\mathcal{B} = [-2, 3]$. Find $\mathcal{A} \cup \mathcal{B}$ and $\mathcal{A} \cap \mathcal{B}$ in interval notation.

2. Let $\mathcal{A} = \{-1, 0, 1\}$ and $\mathcal{B} = \{x : x^3 - 5x^2 - 6x = 0\}$. Is $\mathcal{A} \subseteq \mathcal{B}$?

Suppose $\mathcal{S} \subseteq \mathbb{R}$. We say that a number M is an **upper bound of $\mathcal{S}$** if $x \leq M$ for all $x \in \mathcal{S}$ and m is a **lower bound of $\mathcal{S}$** if $m \leq x$ for all $x \in \mathcal{S}$. The set $\mathcal{S}$ is **bounded** if it has both an upper and lower bound.

3. Solve the inequality over $\mathbb{R}$ in interval notation then determine if the solution set is bounded.

$$-4x - 3 > -2x - 11$$

4. Solve the inequality over $\mathbb{R}$ in interval notation then determine if the solution set is bounded.

$$\frac{x-2}{x+4} \leq 3$$

5. Solve the inequality over $\mathbb{R}$ in interval notation then determine the **least upper bound** and the **greatest lower bound** of the solution set.

$$|x - 6| < 8$$