Hw Sec 10.1 – solved mostly by defs. + graphs

#1a) $2(1+4^x) = 6$

$1 + 4^x = 3$

$4^x = 2$

$\boxed{x = 1/2}$

b) $\underbrace{2^{x+3} = 4^{x-1} = (2^2)^{x-1} = 2^{2x-2}}$

$x + 3 = 2x - 2$

$\boxed{x = 5}$

c) $\dfrac{5^{x+3}}{5^{2x}} = 25$ manipulate the base + exp using rules of exps

$\dfrac{a^m}{a^n} = a^{m-n}$

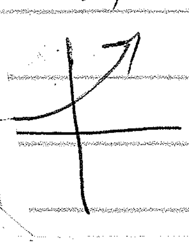
$5^{x+3-2x} = 25$

$\underbrace{5^{3-x} = 25 = 5^2}$

$3 - x = 2$

$\boxed{x = 1}$

d) $x^3 e^x - e^x = 0$



$e^x(x^3 - 1) = 0$

$e^x \neq 0, \quad x^3 - 1 = 0$

$\cancel{x=}$ $\boxed{x = 1}$

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#1b $\boxed{2^{x+3} = 4^{x-1}}$

$= \cancel{2 \cdot 2}$

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

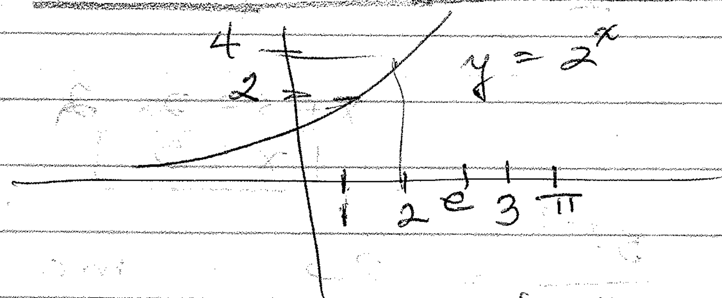
$$2^{x+3} = 2^{2(x-1)}$$

$$x + 3 = 2x - 2$$

$$\boxed{x = 5}$$

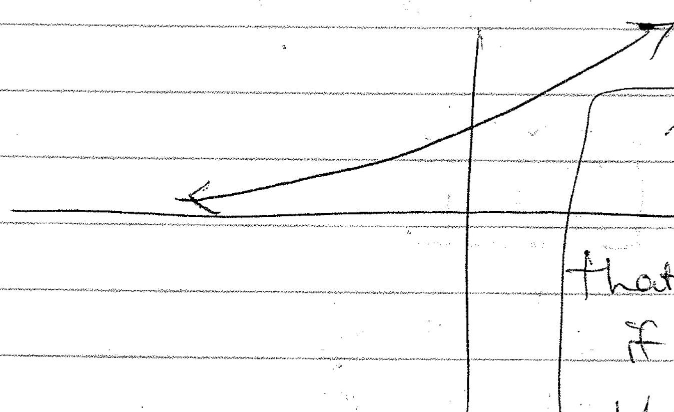
Check: $2^8 \stackrel{?}{=} 4^4$

$256 \cancel{+28} = 16 \cdot 16$



x	$2^x = y$
-2	$1/4$
-1	$1/2$
0	1 ←
1	2
2	4
e	2^e
3	8
π	2^π

The meaning of $2^{\text{real } \#}$ is valid b/c we see it on the graph.



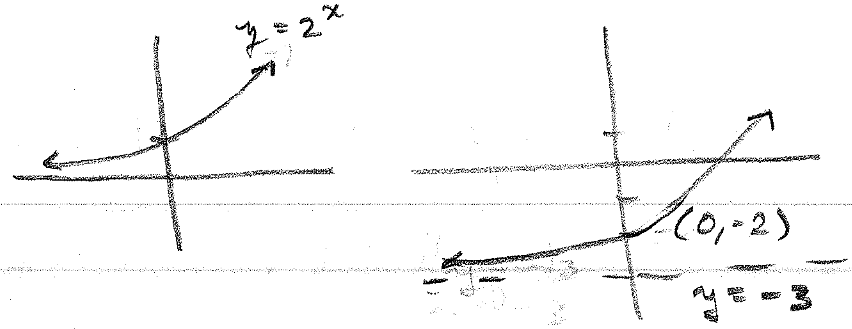
$y = a^x$ is a one-one fcn

that is:

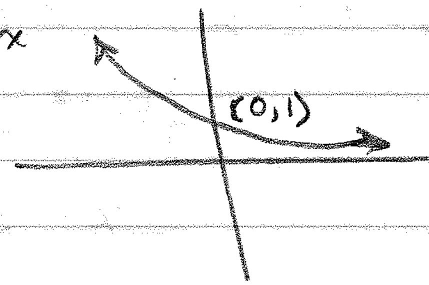
if $a^{x_1} = a^{x_2}$

then $x_1 = x_2$

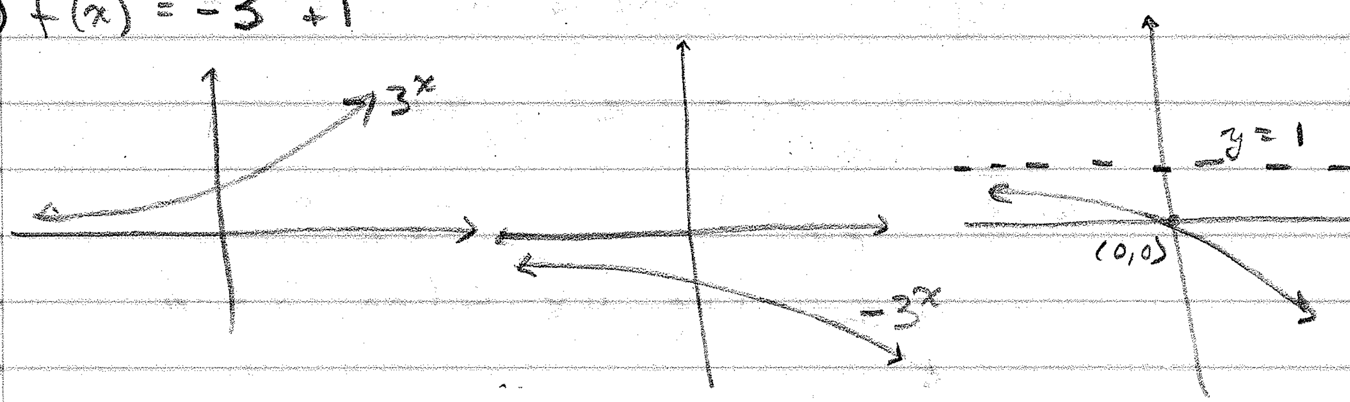
#2) a) $f(x) = 2^x - 3$



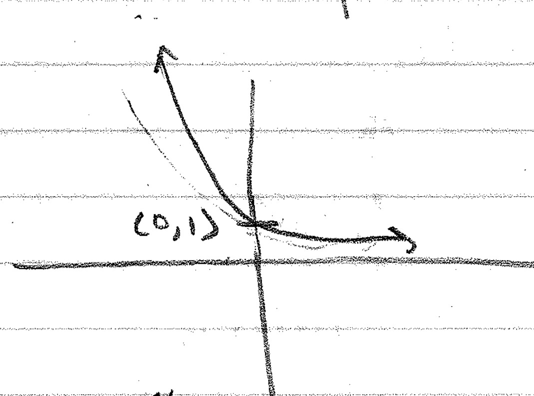
b) $f(x) = \left(\frac{1}{e}\right)^x = e^{-x}$



c) $f(x) = -3^x + 1$



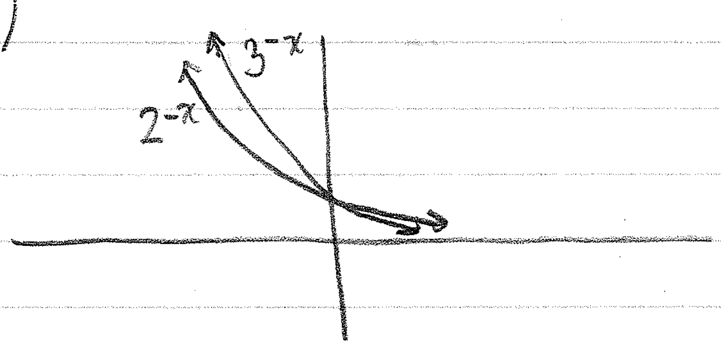
d) $f(x) = 5^{-x}$



#3) $\left(\frac{1}{2}\right)^x < \left(\frac{1}{3}\right)^x$ for what x?

$2^{-x} < 3^{-x}$

on $(-\infty, 0)$



#4) $\log_9 x = \frac{1}{2}$, $9^{1/2} = x$, $x = 3$

$\log_x 11 = 1$, $11 = x$

$\log_x 27 = \frac{3}{2}$, $27 = x^{3/2}$, $(27)^{2/3} = (x^{3/2})^{2/3}$

$$(27^{1/3})^2 = x$$

$$x = 3^2 = 9$$

#5) $\log_6 37$ versus $\log_7 48$

Since $\log_6 36 = 2 < \log_6 37$

and $\log_7 49 = 2 > \log_7 48$

then $\log_7 48 < \log_8 37$ //

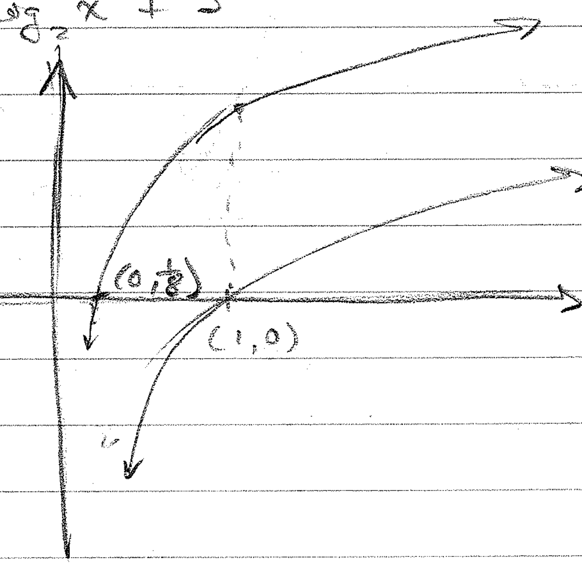
#6) $f(x) = \log_2 x + 3$

root?

$\log_2 x + 3 = 0$

$\log_2 x = -3$

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



HW - Sec 10.2

Def - "Common log" $\log_{10} x$ written as $\log x$

~~Def~~

Def
$\ln \equiv \log_e$ "natural log"

Sec. 10.2

#1) a) $5 = \log_2 x$
by def $x = 2^5 = 32$

b) $y = \ln 2.7$
$2.7 = e^y$

c) $12 = \log_a 5$
$a^{12} = 5$

#2) a) $3^x = 2$
$\log_3 2 = x$

b) $e^5 = y$
$\log_e y = 5$
$\ln y = 5$

c) $x^4 = 9$
$\log_x 9 = 4$

#3 a) $\ln 1 = 0$
b/c $e^0 = 1$

b) $\log(.01) = -2$
b/c $10^{-2} = \frac{1}{100}$

c) $\log_3 81 = 4$
b/c $3^4 = 81$

d) $\log_4 2 = 1/2$
b/c $2 = 4^{1/2}$

e) $\log_3 \frac{1}{27} = -3$
b/c $3^{-3} = \frac{1}{3^3}$

f) $\log_{1/2} 8 = -3$
b/c $\left(\frac{1}{2}\right)^{-3} = 2^3$

g) $\log_4 2 + \log_4 16$
$= \frac{1}{2} + 2 = 5/2$

h) $\log_2 \sqrt[3]{\sqrt[4]{2}} = \log_2\left(\left(2^{1/4}\right)^{1/3}\right)$
$= \log_2 \left(2^{1/4}\right)^{1/3} = \log_2 2^{1/12}$
$= \frac{1}{12} \log_2 2 = \frac{1}{12} \cdot 1 = \frac{1}{12}$

i) $2 \ln e^3 + \ln e^{-5} + e^{\ln 3}$
$= 3 \cdot 2 \ln e + -5 \cdot \ln e + 3$
$= 6 \cdot 1 + -5 \cdot 1 + 3$
$= 4$