Math 110 - Homework 1

Section 4.1

#32 $a^{\sqrt{2}} \cdot (a^2)^{\sqrt{8}} = a^{\sqrt{2}+2\sqrt{8}}$ (2 pts)

$= a^{\sqrt{2}+4\sqrt{2}} = a^{5\sqrt{2}}$

#35 find $f(x) = c\,a^x$ for (2 pts)

(a) (1,1) and (2,5)

(a) $1 = ca^1$

$\Rightarrow c = a^{-1} = 1/a$

$5 = ca^2 = a^{-1}a^2 = a^1 = a$

$c = 1/a$ $\quad a = 5$ $\quad c = 1/5$

$f(x) = (1/5)\cdot 5^x = 5^{x-1}$

(b) (1,1) and $(2, 1/5)$

$1 = ca^1 \Rightarrow c = 1/a$

$1/5 = ca^2 = 1/a\, a^2 = a$

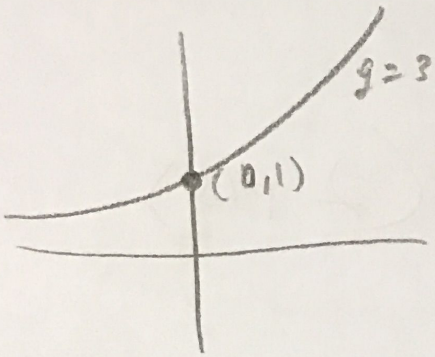
$a = 1/5 \quad c = 5$

$f(x) = 5(1/5)^x$

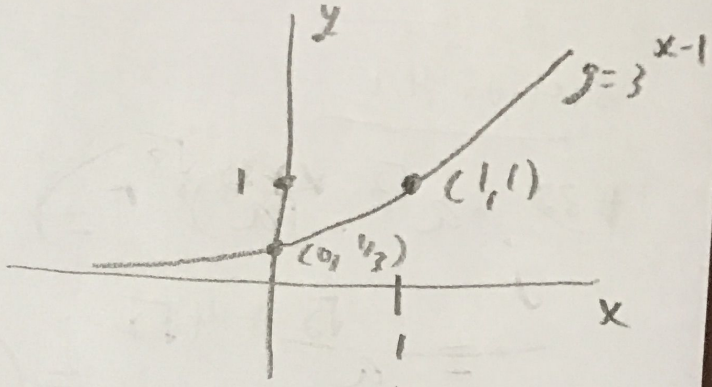
$f(x) = (1/5)^{x-1}$

#49

$g(x) = 3^{x-1}$



shift right 1 unit

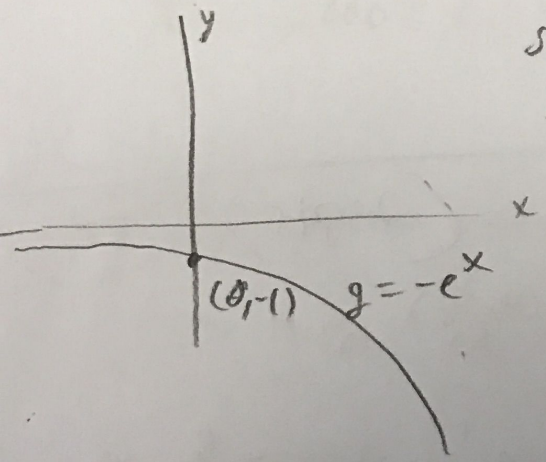


Domain: $(-\infty, \infty)$

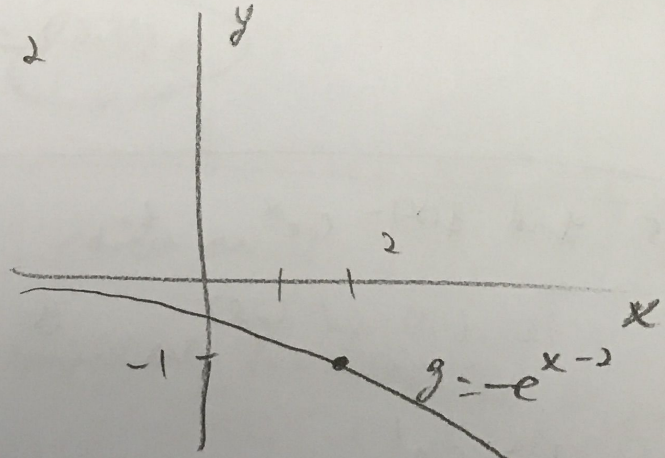
Range: $(0, \infty)$

H.A: $y=0$

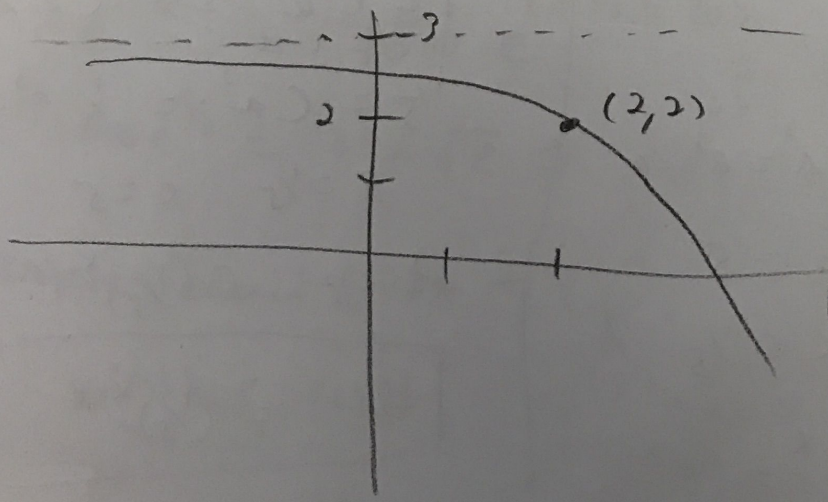
#55 $g(x) = -e^{x-2} + 3$ (2pts)



shift right 2



shift up 3



Domain: $(-\infty, \infty)$

Range $(-\infty, 3)$

H.A $y=3$

#61 $y = 2^x$ left 2 up 5

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

#65 $P = 5000$ $r = 10\% = 0.1$ $t = 5$ years.

Simple interest $\Rightarrow I = Prt$

$I = 5000(0.1)(5) = \$2500$

(2 pts)

#71 (a) future value (b) interest earned.

$P = 7500$ at 5% compounded continuously for 10 years.

$A = Pe^{rt} = 7500\, e^{(0.05)(10)} = 7500\, e^{0.5}$

$= 7500 e^{1/2} = 7500\sqrt{e} \approx \$12365.41$

(b) Interest earned $= A - P$

$\approx \$4865.41$

(2 pts)

#42 Sometown, USA $P_0 = P(0) = 12000$

Make time "zero" 2000.

year 2010 => $t = 10$

2020 => $t = 20$

(0, 12000)

(10, 15000)

$P(t) = P_0 e^{rt} = 12000 e^{rt}$

$P(10) = 12000 e^{10r} = 15000 \Rightarrow e^{10r} = \frac{15}{12} = \frac{5}{4}$

$e^r = (5/4)^{1/10}$

$P(20) = 12000$

$12000 e^{20r} = 12000 (e^{10r})^2 = 12000 (5/4)^2$

$P(20) = 18{,}750$

#95 Interest Rate

12-year Bond → $60,000.00

At 12 years bond redeemed for $95,600.00.

Interest compounded quarterly. Interest Rate?

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

$$95600 = 60000\left(1 + \frac{r}{4}\right)^{4(12)} = 60000\left(1 + \frac{r}{4}\right)^{48}$$

$$\left(1 + \frac{r}{4}\right)^{48} = \frac{95600}{60000} = \frac{956}{600} = \frac{239}{150}$$

$$\left(1 + \frac{r}{4}\right) = \left(\frac{239}{150}\right)^{1/48}$$

$$\frac{r}{4} = \left(\frac{239}{150}\right)^{1/48} - 1$$

$$r = 4\left[\left(\frac{239}{150}\right)^{1/48} - 1\right]$$

$r \approx 0.039$

$r \approx 3.9\%$

#98 Doubling

$V = 1000\ cm^3$

Bacteria doubles every minute

How long until half full if full in 60 min?

If full in 60 min it was half full in

59 min since every minute it would double!