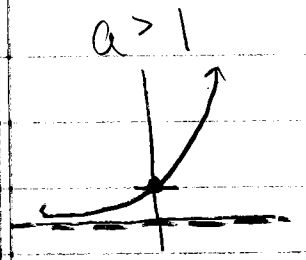
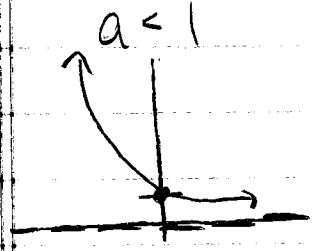
pg. 388 17, 19, 23-27 odd, 39, 41, 51-59 odd
63, 67, 69

5.1 Exponential Functions and Their Graphs

$f(x) = a^x$



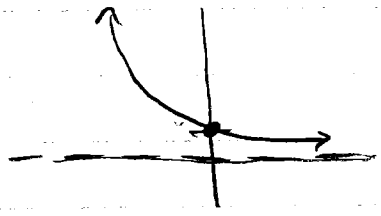
Increasing
Domain: $\mathbb{R}$
Range: $(0, \infty)$
Horizontal asymptote: $x = 0$
y-intercept: $(0, 1)$



Decreasing
Domain: $\mathbb{R}$
Range $(0, \infty)$
Horizontal asymptote: $x = 0$
y-intercept: $(0, 1)$

Example 1 Use a grapher to construct a table of values and sketch a graph

(A) $f(x) = 3^{-x}$
$= \frac{1}{3}^x$



Calculator: $y = 3^{-x}$

2nd Table Set Tblstart = -3
ΔTbl = 1
Indep Auto
Dep Auto

* Indep Ask
⊕ plug in values

Example 2 Describe the transformation of the graph of $g(x)$

(A) $f(x) = 5^x$ $\quad g(x) = -5^{x+1}$

Reflection in x-axis

left 2

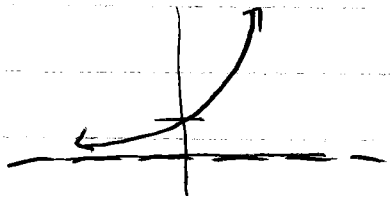
(B) $f(x) = 3^x$ $\quad g(x) = 1 + 3^{-x}$

Reflection in y-axis

up 1

Natural base e $\quad e \approx 2.7182818284\ldots$

$f(x) = e^x$



One-to-one property If $a^x = a^y$, then $x = y$

Example 3 Solve using the one-to-one property

(A) $5^{x-2} = \frac{1}{125}$

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

$x - 2 = -3$

$\boxed{x = -1}$

(B) $e^{x^2+6} = e^{5x}$

$x^2 + 6 = 5x$

$x^2 - 5x + 6 = 0$

$(x-3)(x-2) = 0$

$\boxed{\begin{array}{l} x = 3 \\ x = 2 \end{array}}$

5.1 cont'd

Compound Interest

Annual: $A = P(1+r)^t$
Monthly: $A = P\left(1+\frac{r}{12}\right)^{12t}$
Quarterly: $A = P\left(1+\frac{r}{4}\right)^{4t}$
Daily: $A = P\left(1+\frac{r}{365}\right)^{365t}$

A = final balance
P = Principal
r = rate (as decimal)
2% = .02
t = time in years

*exponent = total compounding each year

Example 4

(A) What is the final balance after 2.5 years on a $1000 loan if 6.2% interest is charged and compounded monthly?

$A = P\left(1+\frac{r}{12}\right)^{12t}$
$= 1000\left(1+\frac{.062}{12}\right)^{12\cdot 2.5}$
$= \$1167.192$

(B) How much needs to be invested for 5 years at 7.3% compounded quarterly to have $3000 at the end of 5 years?

$3000 = P\left(1+\frac{.073}{4}\right)^{4.5}$
$\frac{3000}{3000} = \frac{P(1.436\ldots)}{3000}$
$2089.454 = P$

* Don't round until the end. Divide by answer in the calculator *

Compounding Continuously $A = Pe^{rt}$

A = final balance P = Principal
r = rate as decimal t = time

Example 5 Upon graduation you invest $2000 compounded continuously at 5.3%. What is the balance after:

(A) 5 years

$A = 2000e^{.053 \cdot 5}$

$= \boxed{2606.862}$

(B) 10 years

$A = 2000e^{.053 \cdot 10}$

$= \boxed{3397.865}$

Grew $\approx$ 600 in 5 years
$\approx$ 1400 in 10 years