REVIEW OF FUNCTIONS

THE FORMULA $A = \pi r^2$ FOR THE AREA OF A CIRCLE IS A RULE WHICH ASSOCIATES WITH EACH POSITIVE REAL NUMBER r EXACTLY ONE OTHER NUMBER A, NAMELY, THE AREA OF A CIRCLE OF RADIUS r.

A REAL-VALUED FUNCTION OF A REAL VARIABLE (OR JUST FUNCTION FOR SHORT) CONSISTS OF TWO THINGS:

(1) A SET D OF REAL NUMBERS CALLED THE DOMAIN

(2) A RULE WHICH ASSOCIATES WITH EVERY REAL NUMBER x IN THE DOMAIN D EXACTLY ONE NUMBER y CALLED THE VALUE OF THE FUNCTION AT x.

THE SET OF ALL VALUES OF THE FUNCTION IS CALLED ITS RANGE.

THE RULES ARE GENERALLY GIVEN NAMES LIKE

$$f, g, \ldots, F, G, \ldots$$

IF THE NAME IS f, THEN THE VALUE OF f AT x IS OFTEN WRITTEN

$$f(x) \qquad (\text{"}f \text{ of } x\text{"})$$

RATHER THAN y:

$$y = f(x)$$

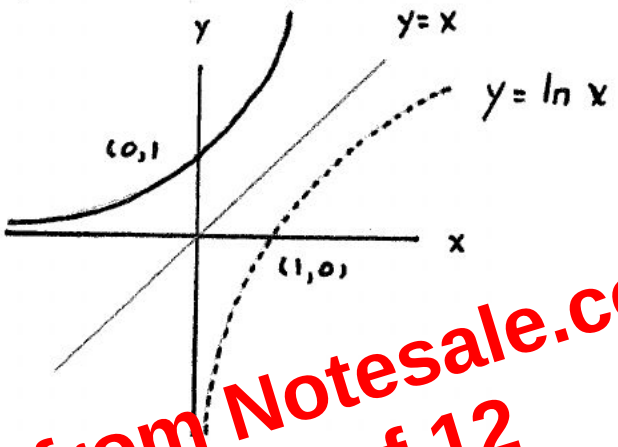
$\ln^{-1}$ IS CALLED THE <u>EXPONENTIAL FUNCTION</u> AND ITS VALUE AT ANY x IN $(-\infty, \infty)$ IS WRITTEN

$$\exp(x)$$

OR

$$e^x .$$

GRAPHS OF INVERSE FUNCTIONS ARE OBTAINED BY " REFLECTING ACROSS THE LINE $y = x$ " SO $y = e^x$



SINCE $\ln x$ AND e^x ARE INVERSES,

$$e^{\ln x} = x \quad , \quad 0 < x < \infty$$

$$\ln(e^x) = x \quad , \quad -\infty < x < \infty$$

THE PROPERTIES OF $\ln x$ LISTED EARLIER TRANSLATE INTO THE FAMILIAR PROPERTIES OF THE EXPONENTIAL FUNCTION (WHICH YOU MUST KNOW) :

$$e^0 = 1$$

$$e^a e^b = e^{a+b}$$

$$\frac{e^a}{e^b} = e^{a-b}$$

$$(e^a)^r = e^{ar}$$