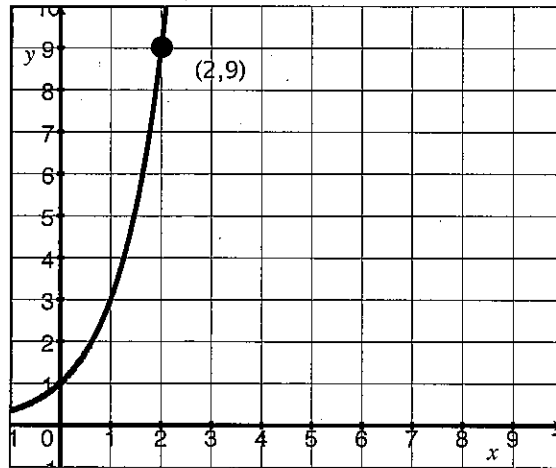


Key

Quiz 4

Show *all* your work. No credit is given without reasonable supporting work. There are *two* sides to this quiz.



1. [2] (§4.1 #15) Find the exponential function $f(x) = a^x$ whose graph is given above.

note (2,9) is on the graph so

started (+.5)

(+.5) $a^2 = 9$

(+.5) $\Rightarrow a = \pm 3$

the exp function with a neg base doesn't look like the above

thus $f(x) = 3^x$ (+.5)

2. [3] (§4.2 #47) The function f has an inverse. Find f^{-1} and then graph f^{-1} on the axis above.

note f has an inverse because the graph passes the horizontal line test

Given $y = 3^x$

(+1) swap x & y
solve for y

$x = 3^y$

$\ln x = \ln 3^y$

$\ln x = y \ln 3$

$y = \frac{\ln x}{\ln 3}$

(+.5) use log
(+.5) use log prop
(+.5) substitution
(+.5) got it

note $\log_3 x$ or $\frac{\log_b x}{\log_b 3}$ would have worked too.

3. [2] (§4.4 #45) Solve the logarithmic equation for x

$$\log_5 x + \log_5(x-1) = \log_5(4x)$$

$$\log_5 [x(x-1)] = \log_5(4x)$$

$$\cancel{5} \log_5 [x(x-1)] = \cancel{5} \log_5(4x)$$

$$x(x-1) = 4x$$

$$x^2 - x = 4x$$

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

$$x(x-5) = 0$$

$$\text{So } x=0 \text{ or } x-5=0$$

log prop (1.5)
use exp (1.5)
notation (1.5)
algebra (1.5)

thus

$$x=0 \text{ or } x=5$$

Note $\log_5 0$ is undef.

So we need to throw out 0 as a solution.

$$x=5$$

4. [3] (§4.4 #69) Find the time required for an investment of \$5000 to grow to \$9000 at an interest rate of 8.2% per year, compounded quarterly.

(Interesting note: the S&P had an average annual return of 8.2% over the past 20 years according to Thomson Reuters.)

we make use of $P(1 + \frac{r}{n})^{nt} = \$$ after t years

$$+1) \quad 5000 \left(1 + \frac{.082}{4}\right)^{4t} = 9000$$

$$\left(1 + \frac{.082}{4}\right)^{4t} = \frac{9}{5}$$

$$\ln \left(1 + \frac{.082}{4}\right)^{4t} = \ln \frac{9}{5}$$

$$4t \ln \left(1 + \frac{.082}{4}\right) = \ln \frac{9}{5}$$

$$t = \frac{\ln \frac{9}{5}}{4 \ln \left(1 + \frac{.082}{4}\right)}$$

↓ solve for t .

alg/order of operations (1.5)

notation (1.5)

use logarithm (1.5)