FST
PS 5.6

Name: Key
Date: Block:

Problem Set 5.6

Solve the equations. Show all of your work in order to receive full credit.

1.) $5^{x-4}=25^{x-6}$

$5^{x-4}=5^{2(x-6)}$

$x-4=2(x-6)$

$x-4=2x-12$

$\boxed{8=x}$

2.) $36^{5x+2}=\left(\frac{1}{6}\right)^{11-x}$

$6^{2(5x+2)}=6^{-1(11-x)}$

$10x+4=-11+x$

$\frac{9x}{9}=\frac{-15}{9}$

$\boxed{x=\frac{-5}{3}}$

3.) $\log_4(x+3)-\log_4(x-5)=2$

$\log_4\frac{x+3}{x-5}=2$

$4^2=\frac{x+3}{x-5}$

$16(x-5)=x+3$

$16x-80=x+3$

$15x=83$

$\boxed{x=\frac{83}{15}}$

4.) $5^{2x+1}=3^{x-5}$

$\ln 5^{2x+1}=\ln 3^{x-5}$

$(2x+1)\ln 5=(x-5)\ln 3$

$2x\ln 5+\ln 5=x\ln 3-5\ln 3$

$2x\ln 5-x\ln 3=-\ln 5-5\ln 3$

$x(2\ln 5-\ln 3)=-\ln 5-5\ln 3$

$\boxed{x=\frac{-\ln 5-5\ln 3}{2\ln 5-\ln 3}}$

5.) $\log_4(-x)+\log_4(x+10)=2$

$\log_4 -x(x+10)=2$

$4^2=-x^2-10x$

$x^2+10x+16=0$

$(x+8)(x+2)=0$

$\boxed{x=-8}$ $\boxed{x=-2}$

6.) $\log_5(5x+9)=\log_5(6x)$

$5x+9=6x$

$\boxed{9=x}$

7.) $\frac{1}{3}\log_5(12x)=2$

$\log_5 12x=6$

$5^6=12x$

$\boxed{\frac{5^6}{12}=x}$

$x=1302.083$

8.) $\log_2(x-4)=5$

$2^5=x-4$

$32=x-4$

$\boxed{x=36}$

9.) $10^{x+4}=3^{5x-1}$

$\log 10^{x+4}=\log 3^{5x-1}$

$(x+4)\boxed{\log 10}^{=1}=(5x-1)\log 3$

$x+4=5x\log 3-\log 3$

$x-5x\log 3=-4-\log 3$

$x(1-5\log 3)=-4-\log 3$

$\boxed{x=\frac{-4-\log 3}{1-5\log 3}}$

10.) $\log_2(x)+\log_2(x-2)=3$

$\log_2 x(x-2)=3$

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

$8=x^2-2x$

$0=x^2-2x-8$

$0=(x-4)(x+2)$

$\boxed{x=4}$ $\boxed{x=-2}$

11.) $5\ln(x) = 35$

$\ln x = 7$

$e^7 = x$

12.) $\ln(-3x-1) - \ln 7 = 2$

$\ln\left(\frac{-3x-1}{7}\right) = 2$

$e^2 = \frac{-3x-1}{7}$

$\frac{7e^2+1}{-3} = x$

13.) $8^x = 20$

$\log_8 20 = x$

14.) $\log(5x-2)^2 = 4$

$2\log(5x-2) = 4$

$\log 5x-2 = 2$

$10^2 = 5x-2$

$100 = 5x-2$

$102 = 5x$

$x = \frac{102}{5}$

15. $e^{-x} = 5$

$\ln \quad \ln$

$\frac{-x}{-1} = \frac{\ln 5}{-1}$

$x = -\ln 5$

16. $7^{3x} = 18$

$\log_7 18 = 3x$

$x = \frac{\log_7 18}{3}$

17.) $10^{4x-3} = 24$

$\log_{10} 24 = 4x-3$

$\frac{(\log_{10} 24)+3}{4} = \frac{4x}{4}$

$x = \frac{\log 24 + 3}{4}$

18.) $\log(x) + \log(x-1) = \log 72$

$\log x(x-1) = \log 72$

$x^2 - x = 72$

$x^2 - x - 72 = 0$

$(x-9)(x+8) = 0$

$x = 9$ ~~$x = -8$~~

Word Problem. An investment of \$1,750 earns 5.75% interest, which is compounded monthly. After approximately how many years will the investment be worth \$5,000?

$P = 1750$ $r = .0575$ $n = 12$ $A = P(1+\frac{r}{n})^{nt}$

$5000 = 1750(1+\frac{.0575}{12})^{12t}$

$2.857 = (1.00479)^{12t}$

$\log_{1.00479} 2.857 = 12t$

$219.61779 = 12t$

$t = 18.3$ years

A stock bought at an initial price of \$5 per share is worth \$12 after 7 years. Find the rate of continuously compounded interest in this investment.

$P = 5$ $t = 7$ $A = Pe^{rt}$

$12 = 5e^{r \cdot 7}$

$\ln\frac{12}{5} = \ln e^{7r}$

$\frac{\ln\frac{12}{5}}{7} = \frac{7r}{7}$

$r = \frac{\ln 12/5}{7}$ $r = .125$

Rate = 12.5%