MATH 171 TEST 2 SOLUTIONS

QUESTION 1

1-(a) $\boxed{3.459}$ (b) $\boxed{34}$ (c) $\boxed{15.13}$

2- $x = 3^{213}$

$\log x = \log 3^{213}$

$\log x = 213 \log 3$

$\log x = 101.627$

$x = 10^{101.627}$

$x = 10^{0.627} \times 10^{101}$

$= \boxed{4.24 \times 10^{101}}$

3- (a) $\frac{1}{x-3} - \frac{6}{x^2-9} = \frac{1}{2}$

$\frac{2(x+3)}{2(x^2-9)} - \frac{6(2)}{2(x^2-9)} = \frac{x^2-9}{2(x^2-9)}$

$2x+6-12 = x^2-9$

$0 = x^2-2x-3$

$0 = (x-3)(x+1)$

$\boxed{x \neq 3 \text{ , } x = -1}$

Note 3 is not in domain so is not a solution

(b) $\log_2 x(2x-5) = \log_2 3$

$x(2x-5) = 3$

$2x^2 - 5x = 3$

$2x^2 - 5x - 3 = 0$

$2x^2 - 6x + x - 3 = 0$

$2x(x-3) + 1(x-3) = 0$

$(2x+1)(x-3) = 0$

$\boxed{x \neq -\frac{1}{2} \quad x = 3}$

Note Negatives inside logs are impossible

(c) $3^x = 4^{x+1}$

$\ln 3^x = \ln 4^{x+1}$

$x \ln 3 = (x+1)\ln 4$

$x \ln 3 = x \ln 4 + \ln 4$

$x \ln 3 - x \ln 4 = \ln 4$

$x(\ln 3 - \ln 4) = \ln 4$

$$\boxed{x = \frac{\ln 4}{\ln 3 - \ln 4} = -4.82}$$

(d) $\ln x^5 - \ln 3^2 = \ln e^3$

$$\ln \frac{x^5}{9} = \ln e^3$$

$$\frac{x^5}{9} = e^3 \Rightarrow x^5 = 9e^3$$

$$\boxed{x = (9e^3)^{1/5} = 2.83}$$

4- (a) $\log_b a^2 - \log_b a + \log_b (2a)^3$

$= \log_b \frac{a^2}{a} + \log_b 8a^3$

$= \log_b a(8a^3)$

$\boxed{= \log_b (8a^4)}$

(b) $\log_2 9^{1/2} - \log_2 27 + \log_2 72$

$= \log_2 \left(\frac{3}{27} \cdot 72\right) = \boxed{\log_2 8 = 3}$

(c) $\log_3 x^{\frac{1}{\log_3 2}} - \log_3 27$

$= \log_3 \left(\frac{x^{\frac{1}{\log_3 2}}}{\log_3 27}\right) = \log_3 \left(\frac{x^{\frac{1}{\log_3 2}}}{3}\right)$

5 - vertex $x = \frac{-5}{2(-1)} = \frac{5}{2}$

$y = -\left(\frac{5}{2}\right)^2 + 5\left(\frac{5}{2}\right) - 6 = \frac{1}{4}$

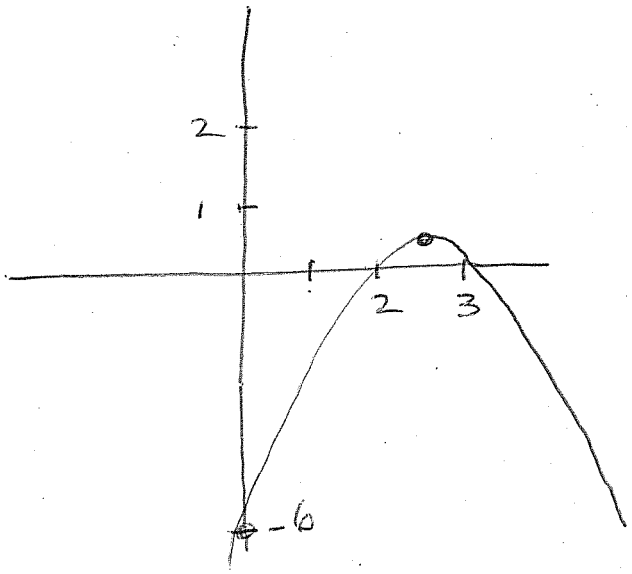
vertex $(5/2, 1/4)$

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

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

$x = 3 \quad x = 2$

y-intercept $y = -6$



6- $$\frac{1-\frac{3}{2x-2}}{\frac{x}{5}-\frac{1}{2}} = \frac{\frac{(2x-2)-3}{2x-2}}{\frac{2x-5}{10}}$$

$$= \frac{2x-5}{2x-2} \cdot \frac{10}{2x-5}$$

$$= \frac{10}{2(x-1)} = \boxed{\frac{5}{x-1}}$$

7- @ $P = 123e^{kt}$

$56 = 123e^{k \cdot 4}$

$\frac{\ln 56}{123} = 4k$

$K = -0.1967$

$P = 123e^{-0.1967t}$

(b) $P = 123e^{-0.1967(10)}$

$P = 17.2 \ \mu Ci$

(c) $7.8 = 123e^{-0.1967t}$

$\ln\left(\frac{7.8}{123}\right) = -0.1967t$

$t = 14.02$

After 14 hours

8- $T = 18 + 19.2e^{kt}$

$36.7 = 18 + 19.2e^{k(0.5)}$

$\ln\left(\frac{18.7}{19.2}\right) = 0.5k \Rightarrow k = -0.0527$

(a) $\boxed{T = 18 + 19.2e^{-0.0527t}}$

(b) $25 = 18 + 19.2e^{-0.0527t}$

$\ln\left(\frac{7}{19.2}\right) = -0.0527t$

$\boxed{t = 19.15}$

IN ABOUT 19 hours

BONUS $\sum_{n=0}^{\infty} \frac{1}{n!} = e$

$\sum_{n=0}^{4} \frac{1}{n!} = \frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} = 1 + 1 + \frac{1}{2} + \frac{1}{6} + \frac{1}{24}$