MATH 117 SOLUTIONS: QUIZ 2 30 JANUARY 2020

1. Solve the following system of linear equations. Show your work

8x + 3y = 39 (Eqn 1)

2x – 5y = -19 (Eqn 2)

Solution: Multiply the second equation by -4 to obtain

-8x + 20y = 76 (Eqn 3)

Adding equations 1 and 3, we obtain

23y = 115

Hence y = 5. Substituting y = 5 into equation (1), we obtain 8x + 15 = 39. So x = 3.

Answer: ***x = 3, y = 5***

2. Let f(x) = $f(x) = 3x^2$ and $g(x) = \frac{2x}{4-x}$. Find and simplify each of the following

(a) $f(-3) = 3(-3)^2 = 27$

(b) $g(5) = \frac{2(5)}{4-5} = -10$

(c) $f(a-2) = 3(a-2)^2 \; or \; 3(a^2 - 4a + 4)$

(d) $g\left(\frac{1}{t}\right) = \frac{2(\frac{1}{t})}{4-\frac{1}{t}} = \frac{\frac{2}{t}}{\frac{4t-1}{t}} = \frac{2}{t}\left(\frac{t}{4t-1}\right) = \frac{2}{4t-1}$

(e) Solve for x when f(x) = 27.

Solution: Since f(x) = 27, $3x^2 = 27, so \; x^2 = 9. \; Thus \; x = \pm 3$

(f) Solve for x when g(x) = 6.

Solution: Since $g(x) = 6$, $\frac{2x}{4-x} = 6. \; Thus \; 2x = 6(4-x), \; x = 3(4-x), \; x = 12 - 3x, \; 4x = 12. \; Finally \; x = 3.$

3. An epidemic of influenza spreads through a city. Figure 2.9 is the graph of I = f(w), where I is the number of individuals (in thousands) infected w weeks after the epidemic begins.

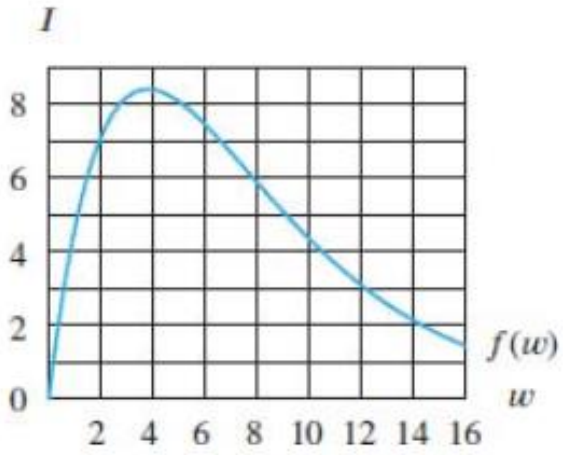

Figure 2.9

(a) Evaluate f(2) and explain its meaning in terms of the outbreak.

Answer: f(2) = 7. This means that at 2 weeks since the beginning of the epidemic equals 7000 people.

(b) Approximately how many people were infected at the height of the epidemic? When did that occur? Write your answer in the form f(a) = b.

Answer: The peak of 8500 individuals appears to be in week 4. That is, f(4) = 8.5.

(c) Solve f(w) = 4.5 and explain what the solutions mean in terms of the epidemic.

Answer: It appears from the graph that 4,500 individuals are infected after one week as well as after 10 weeks.

(d) The graph used $f(w) = 6w(1.3)^w$. Use the graph to estimate the solution of the inequality $6w(1.3)^w \geq 6$. . Explain what the solution means in terms of the epidemic.

Answer: Note that $f(w)$ is the y-coordinate of the graph for each given w. The inequality $f(w) \geq 6$ means that during this time interval, at least 6,000 people have been infected. This is roughly between w = 1.5 and w = 7.8.