Math 120 - Autumn 2015
Final Exam
Answers

1. 82.62
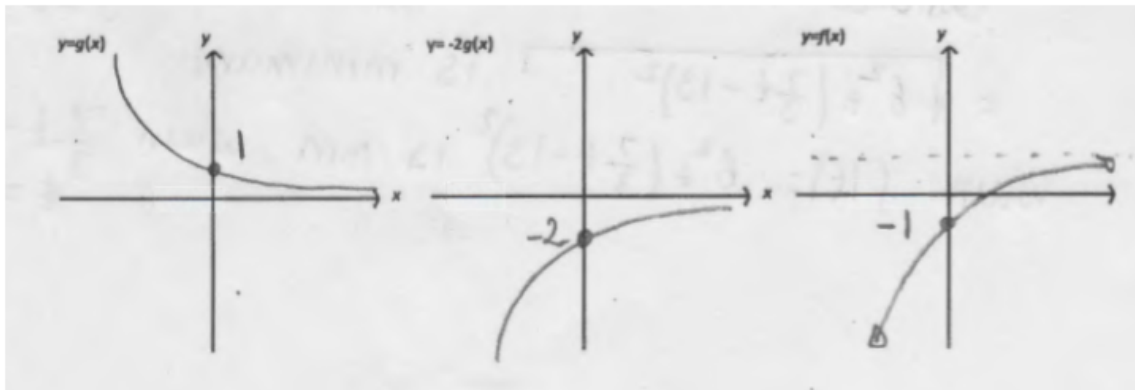
2. (a) $f(x) = 1 - 2e^{-3x}$.

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

   The domain of f is all real numbers, and its range is all real numbers < 1.

   The domain of f^{-1} is all real numbers < 1, and its range is all real numbers.

   (b)

3. (a) $x = -\frac{5}{3}t + 12, y = \frac{2}{3}t$.

   (b) $x = -\frac{5}{3}t + 6, y = -\frac{5}{3}t + 13$.

   (c) $\frac{39}{7} \approx 5.57$ seconds.

4. 3 years.

5. The trees are
$$\frac{100}{\tan(78°) - \tan(64°)} \approx 37.67 \text{ feet apart.}$$

6. (a)
$$A(x) = \begin{cases} -0.25x^2 + 54x & \text{if } 0 \le x \le 48, \\ 2241 - (63 - x)^2 & \text{if } 48 < x \le 63. \end{cases}$$

   (b) Cut should be made at $x = 108 - 2\sqrt{1795.5} \approx 23.25$ cm.

7. The populations will be the same in year 558.

8. (a) Height is $15 - 6\sqrt{3}$.

   (b) Distance =
$$\sqrt{\left(12 - 12\cos\frac{2\pi}{3}\right)^2 + \left(50 + 12\sin\frac{2\pi}{3}\right)^2}.$$