

Math 120 Final Autumn 2004 Answers

Problem 1.

- (a) $(-15.4108, 12.7479)$
(b) 47.0444 seconds.

Problem 2.

- (a) $89x - \frac{1}{6}x$
(b) 11,881.5 kg.

Problem 3

- (a)

$$g(x) = \begin{cases} x + 1 & \text{if } -4 \leq x \leq 1 \\ 2 + \sqrt{4 - (x - 3)^2} & \text{if } 1 \leq x \leq 5 \\ -\frac{1}{3}x + 2.667 & \text{if } 5 < x \leq 8 \end{cases}$$

- (b) $-3 \leq y \leq 4$.

Problem 4.

- (a) you don't have to simplify, but answer should be equivalent to:

$$g(t) = \begin{cases} \frac{5}{3}t - \frac{1}{3}t^2 & \text{if } t \leq 5 \\ \frac{4}{9}t - \frac{4}{9}t^2 + \frac{1}{9}t^3 & \text{if } t > 5 \end{cases}$$

- (b) you don't have to simplify, but answer should be equivalent to:

$$h(t) = \begin{cases} \frac{8}{3}t - \frac{1}{3}t^2 - 1 & \text{if } t \leq 1 \\ \frac{5}{3}t - \frac{4}{3}t^2 & \text{if } 1 < t \leq 5 \\ \frac{4}{9}t - \frac{13}{9}t^2 + \frac{1}{9}t^3 & \text{if } 5 < t \end{cases}$$

Problem 5.

- (a) $[1, 5]$
(b)

$$h^{-1}(x) = 1 + \sqrt{16 - \frac{4}{5}x}$$

- Problem 6.** This answer has $(0, 0)$ at the center of the wheel, but you don't have to put it there. (So other answers would be correct)

$$x(t) = 15 + 3 \cos(150\pi t + \frac{\pi}{2})$$
$$y(t) = -\frac{3}{2} + 3 \sin(150\pi t + \frac{\pi}{2})$$

Problem 7.

- (a)

$$H(t) = 12.5 \sin(\frac{2\pi}{2.3}(t + 0.325)) + 97.5$$

- (b) 70.4833%

Problem 8.

- in the year 2388.278.