

Key

Name: _____
 Quiz 1 (20 points)

You must show all of your work to get credit!

$(2, 108) & (5, 256)$

1. Tony and Hannah are the owners of a booming company, Montana Management, which they started in the year 2001. In 2003, they made 108 million dollars in profit. In 2006, their profits had gone all the way up to 256 million dollars. Let $f(t)$ be a function that gives the profit made (in millions of dollars) as a function of the number of years, t , since Montana Management was founded. Assume $f(t)$ is invertible.

a) Interpret the quantities $f(7)$ and $f^{-1}(100)$. Include units. (2 pts.)

$f(7)$ = Profits (in millions of \$)
 in year $2008 = 2001 + 7$

$f^{-1}(100)$ is how many years the company was running when profits reached \$100 million.

b) Hannah thinks that their profit is growing linearly as a function of time. Assuming this is true, find a function $h(t)$ which fits the given data for $f(t)$. (4 pts)

$$P = mt + b$$

$$108 = 2m + b$$

$$256 = 5m + b$$

$$-148 = -3m$$

$$m = \frac{-148}{-3} = 49.33$$

$$P = 49.3t + 9.3 = h(t) = \left(\frac{148}{3}\right)t + \left(\frac{28}{3}\right)$$

$$108 = 2(49.3) + b$$

$$108 = 98.6 + b$$

$$9.3 = b$$

$$v: 256 \stackrel{!}{=} 5(49.3) + 9.3$$

$$256 \stackrel{!}{=} 246.6 + 9.3$$

$$256 \stackrel{!}{=} 256$$

c) Tony thinks that their profit is growing exponentially as a function of time. Assuming this is true, find a function $a(t)$ which fits the given data for $f(t)$. (4 pts)

$$P = P_0 a^t$$

$$256 = P_0 a^5$$

$$108 = P_0 a^2$$

$$2.37 = a^3$$

$$a = \sqrt[3]{2.37} = \frac{4}{3} = 1.3$$

$$P = 60.75 \left(\frac{4}{3}\right)^t = a(t)$$

$$108 = P_0 \left(\frac{4}{3}\right)^2$$

$$108 = P_0 \cdot \left(\frac{16}{9}\right)$$

$$60.75 = P_0$$

$$v: 256 \stackrel{!}{=} 60.75 \left(\frac{4}{3}\right)^5$$

$$256 \stackrel{!}{=} 60.75 (4.21)$$

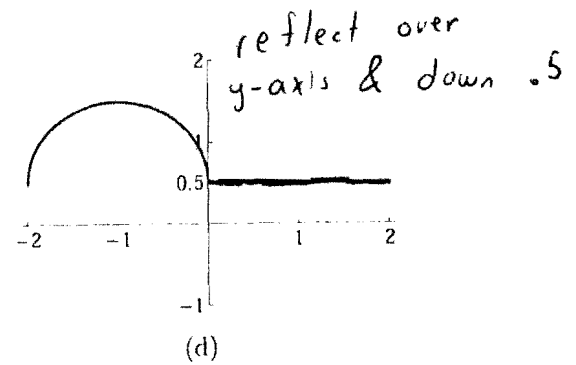
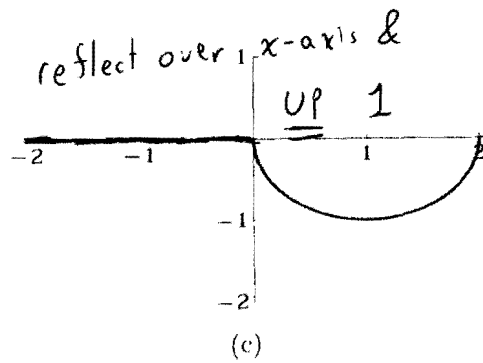
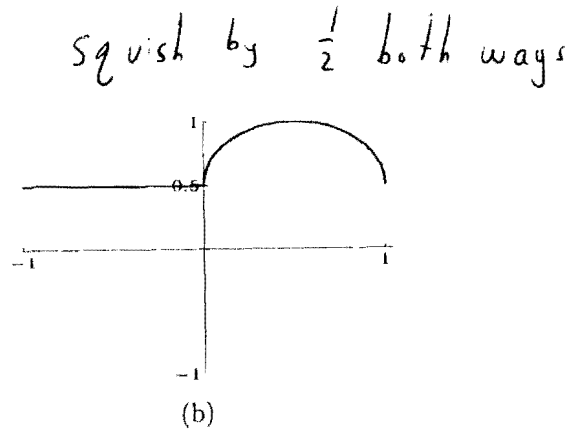
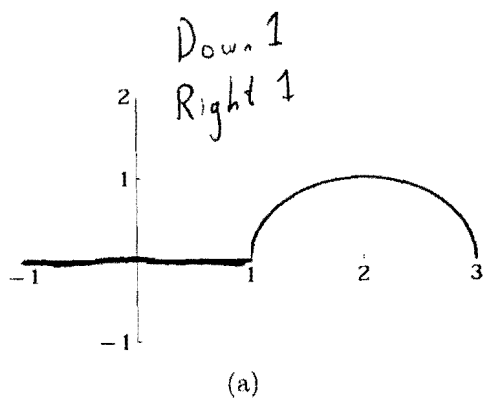
$$256 \stackrel{!}{=} 256$$

d) Suppose that in 2009, Montana Management made 600 million dollars in profit. Whose growth model is more accurate? Justify your answer. (2 pts)

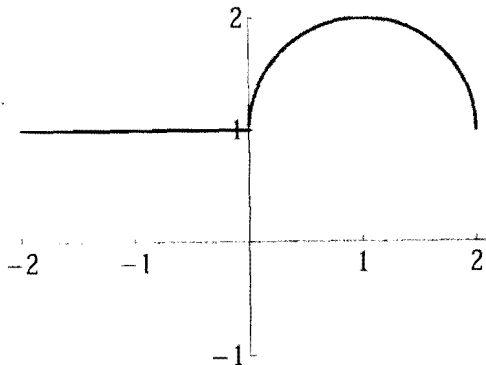
$$h(8) = 404$$

$$a(8) = 606.8$$

Antonio predicts \$606 M, Hannah predicts \$404 M
 Tony's model is better because it more accurately predicts $f(8) = 600$.



2. Given below is the graph of $y = f(x)$.



Find the function for the above graphs in terms of $f(x)$. (No partial credit, 8 points)

Write your answer here

(a) $f(x-1) - 1$

(b) $\frac{1}{2} f(2x)$

(c) $-f(x) + 1$

(d) $f(-x) - .5$