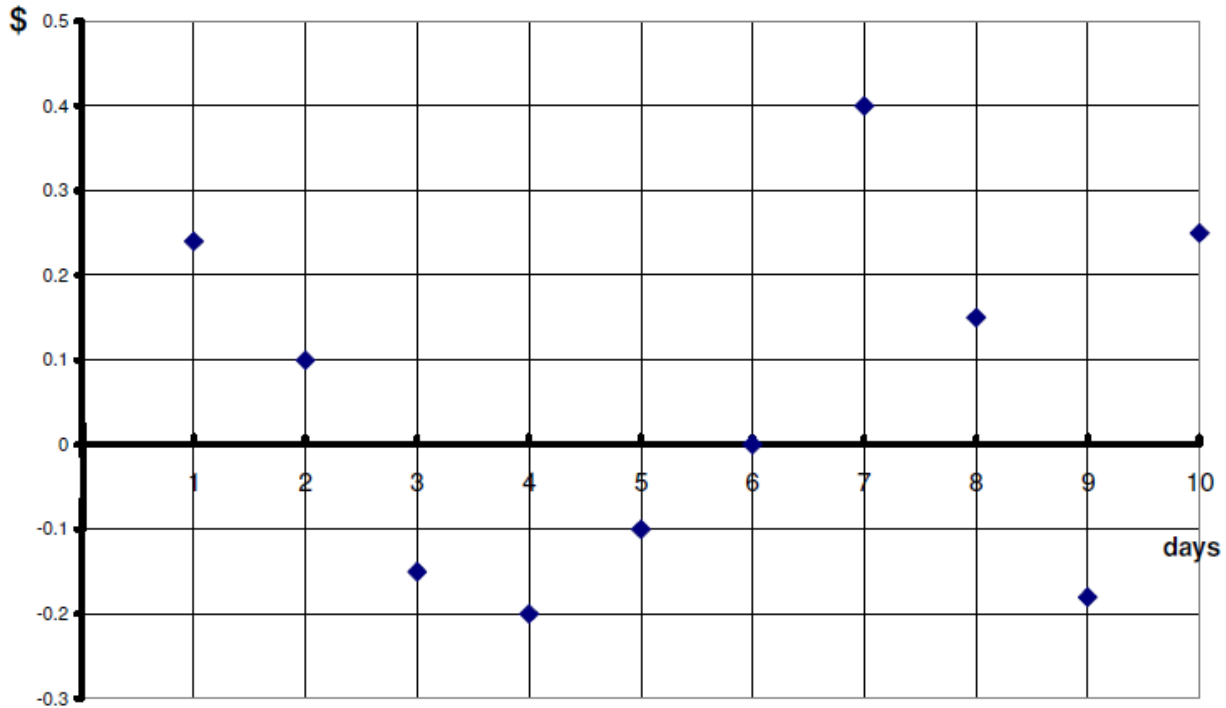**Problem 2** (12 points) The opening price of one share of stock for the BBM Company is monitored over a period of 10 days. The graph below gives **the change** in the price of one share at opening time **compared to the previous day**. For example, the point (3, -0.15) on the graph means that the price of one share of stock at opening on day 3 was lower by $0.15 than the price at opening on day 2.

BBM Co., Change in Price of One Share

a) When was the price higher at opening, on day 7 or on day 8? Explain why.

Answer: The opening price was higher on day _____

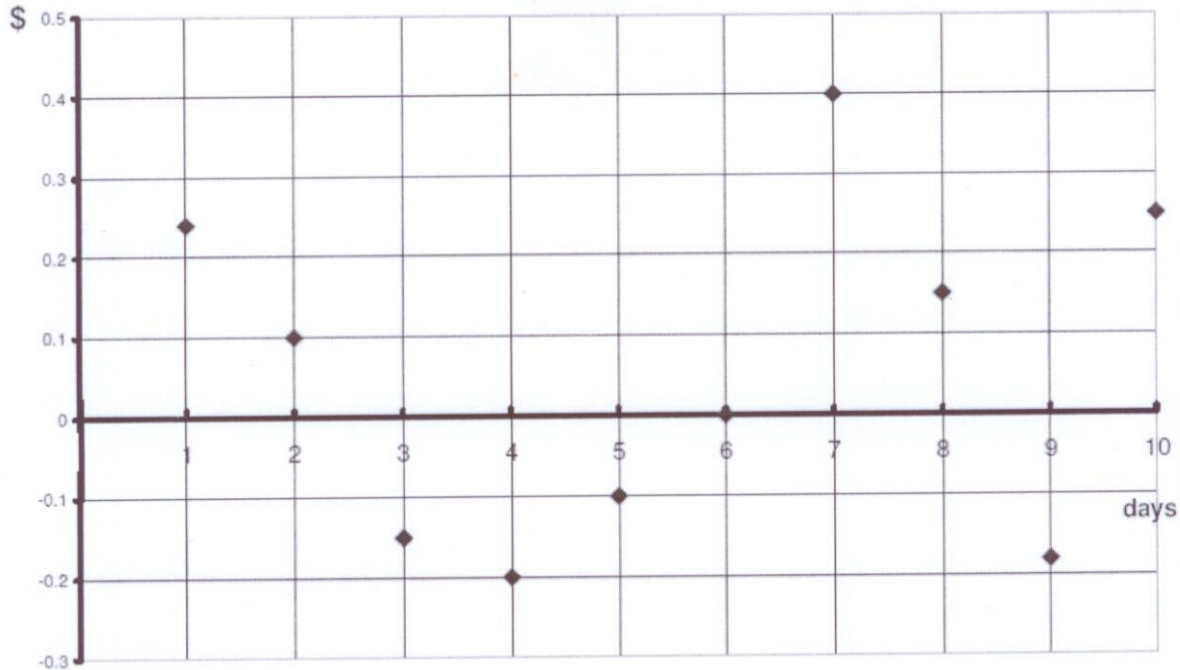b) Suppose the opening price of one share was $10.50 on day 0. What was the opening price on day 7?

Answer: $_____

c) What was the average rate of change of the stock price during the first week? (that is, from opening on day 0 to opening on day 7)

Answer: _____ $ per day

Problem 2 (12 points) The opening price of one share of stock for the BBM Company is monitored over a period of 10 days. The graph below gives **the change** in the price of one share at opening time **compared to the previous day**. For example, the point (3, -0.15) on the graph means that the price of one share of stock at opening on day 3 was lower by $0.15 than the price at opening on day 2.

BBM Co., Change in Price of One Share

a) When was the price higher at opening, on day 7 or on day 8? Explain why.

The point at 8 shows that the price increased by 0.15$ from day 7 to day 8.

Answer: The opening price was higher on day __8__

b) Suppose the opening price of one share was $10.50 on day 0. What was the opening price on day 7?

$$\overset{\sim}{=} \$10.50 + \left(0.25 + 0.1 - 0.15 - 0.2 - 0.1 + 0 + 0.4\right)$$

$$= 10.50 + \underbrace{0.3}_{\text{change over first week}}$$

Answer: $ __10.80.__

c) What was the average rate of change of the stock price during the first week? (that is, from opening on day 0 to opening on day 7)

$$\frac{\$10.80 - 10.50}{7 \text{ days}} \left(OR \quad \frac{0.25 + 0.1 - 0.15 - 0.2 - 0.1 + 0 + 0.4}{7} \right)$$

$$= \frac{0.3}{7} \overset{\sim}{=} 0.042857 \cdots$$

Answer: __0.04__ $ per day

2. The *opening price* of a stock is the value of the stock when the stock market opens. The opening price of one share of stock for the Mambo Dog Company is monitored over several days. The graph below gives the **change** in the opening price since the previous day. For example, the change in price at $t = 1$ is $0.03, which means that the opening price of the stock on day 1 is $0.03 higher than the opening price on day 0.
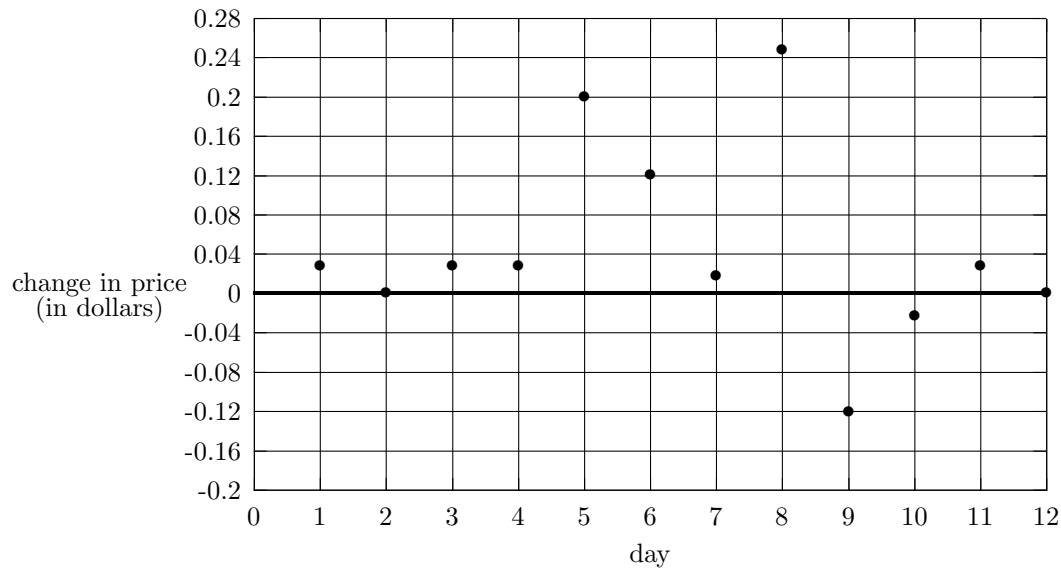
Again, approximate as accurately as you can and include units.

(a) Suppose the opening price of Mambo Dog is $5.35 on day 0. What is the opening price on day 4?

(b) How much higher is the opening price on day 5 than on day 3?

(c) Name all days on which the opening price of Mambo Dog was the same as the day before.

(d)   i. Is the opening price higher on day 5 or day 6? Explain.

       ii. Is the opening price higher on day 9 or day 10? Explain.

2. The *opening price* of a stock is the value of the stock when the stock market opens. The opening price of one share of stock for the Mambo Dog Company is monitored over several days. The graph below gives the **change** in the opening price since the previous day. For example, the change in price at $t = 1$ is $0.03, which means that the opening price of the stock on day 1 is $0.03 higher than the opening price on day 0.
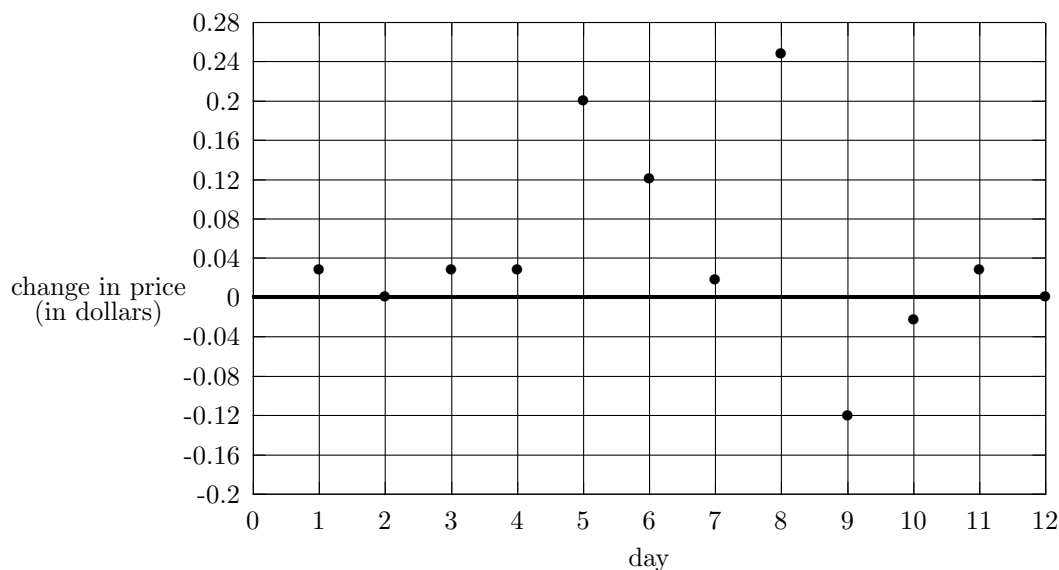
(a) Suppose the opening price of Mambo Dog is $5.35 on day 0. What is the opening price on day 4?

ANSWER: From day 0 to day 1, the price goes up by $0.03. So, on day 1, opening price is $5.38. From day 1 to day 2, the change in price is $0. So, on day 2, price is still $5.38. From day 2 to day 3, price changes by $0.03 and is, therefore, $5.41 on day 3. From day 3 to day 4, it changes by **another** $0.03. So, the opening price on day 4 is $5.44.

(b) How much higher is the opening price on day 5 than on day 3?

ANSWER: The price goes up by $0.03 from day 3 to day 4 and another $0.20 from day 4 to day 5. So, the price is $0.23 higher on day 5 than day 3.

(c) Name all days on which the opening price of Mambo Dog was the same as the day before.

ANSWER: This will happen whenever the change in price is $0. The opening price on day 2 is the same as the day before and the opening price on day 12 is the same as the day before.

(d)   i. Is the opening price higher on day 5 or day 6? Explain.
      ANSWER: The change in price from day 5 to day 6 is $0.12. (The height of the dot above day 6.) So, the price goes up from day 5 to day 6. Price is higher on day 6.

      (Notice that the height of the dot above day 5 is irrelevant here—it gives the change from day 4 to day 5.)

   ii. Is the opening price higher on day 9 or day 10? Explain.
      ANSWER: The change in price from day 9 to day 10 is -$0.02 (the height of the dot at day 10). So, the price goes down from day 9 to day 10. Price is higher on day 9.

      (Again, the position of the dot on day 9 is irrelevant. Why?)

3. (8 points) Sally has a new puppy. Every four months, she weighs the puppy and tracks the incremental rate of change in the puppy's weight. The height of the dot on this graph at time t shows the rate of change, in pounds per month, during the **previous** four months.
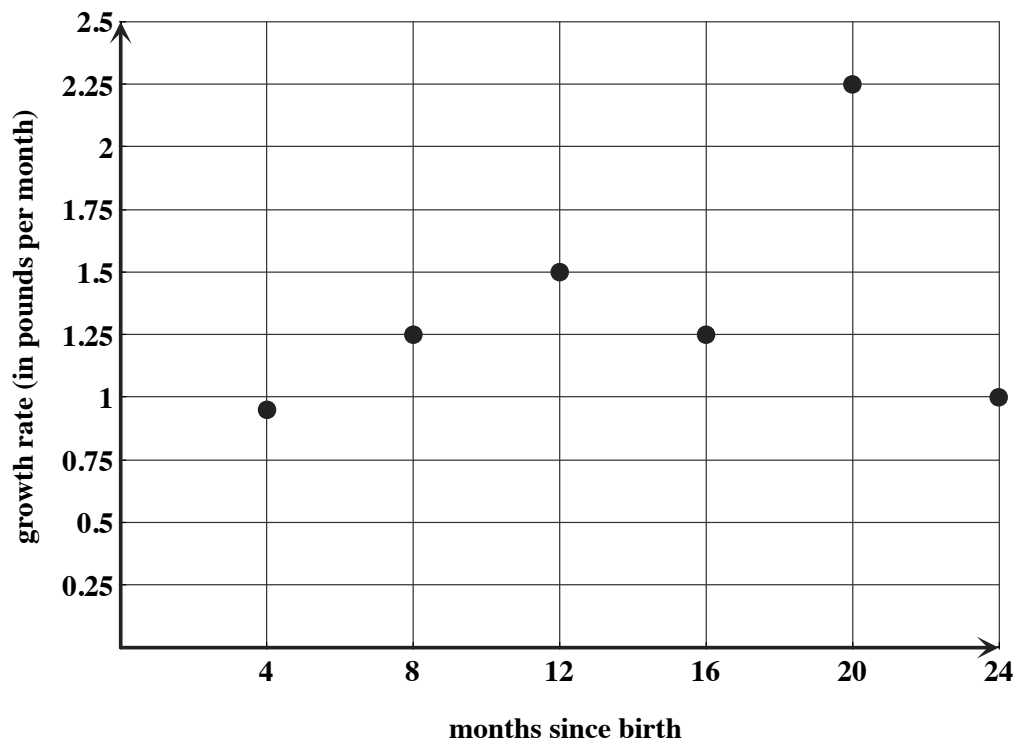
(a) How many pounds does the puppy gain during the four months prior to its first birthday $(t = 12)$?

ANSWER: _____pounds

(b) If the puppy weighs 15 pounds on its first birthday $(t = 12)$, how much does it weigh on its second birthday $(t = 24)$?

ANSWER: _____pounds

(c) When does the puppy weigh more: at $t = 20$ or $t = 24$? Explain your answer.

MATH 111 – EXAM I Hints and Answers
Version Alpha
Autumn 2012

1. (a) (4 points) ~ 1.09 dollars per Item

   (b) (4 points) ~ 0.52 dollars per Item

   (c) (4 points) ~ 8.75 thousand dollars

   (d) (2 points) ~ 1.33 dollars per Item

   (e) (4 points) ~ 2 thousand dollars or 2000 dollars

2. (4 points each)

   (a) $t \approx 37$ minutes

   (b) $t \approx 7$ minutes

   (c) $b \approx 28$ minutes

   (d) Any of the following is acceptable:
      - $B(20) = C(20) + 0.7$
      - $B(20) - C(20) = 0.7$
      - $B(20) - 0.7 = C(20)$

3. (a) (3 points) 6 pounds

   (b) (3 points) 33 pounds

   (c) (2 points) From $t = 20$ to $t = 24$, the puppy gains 4 pounds. So, the puppy weighs more at $t = 24$.

4. (4 points each)

   (a) $q = 135$ units; $p = 84$ dollars

   (b) $q = 187.5 - 0.625p \geq 150$ if $p \leq 60$

2. (12 points) The following graph shows the **change in median home price** in Seattle over each one-month period in 2012. Each dot on the graph shows the change over the **following month**. For example, the height of the dot at $t = 0$ shows that the median home price increased by approximately \$4800 from $t = 0$ to $t = 1$.

months since January 2012
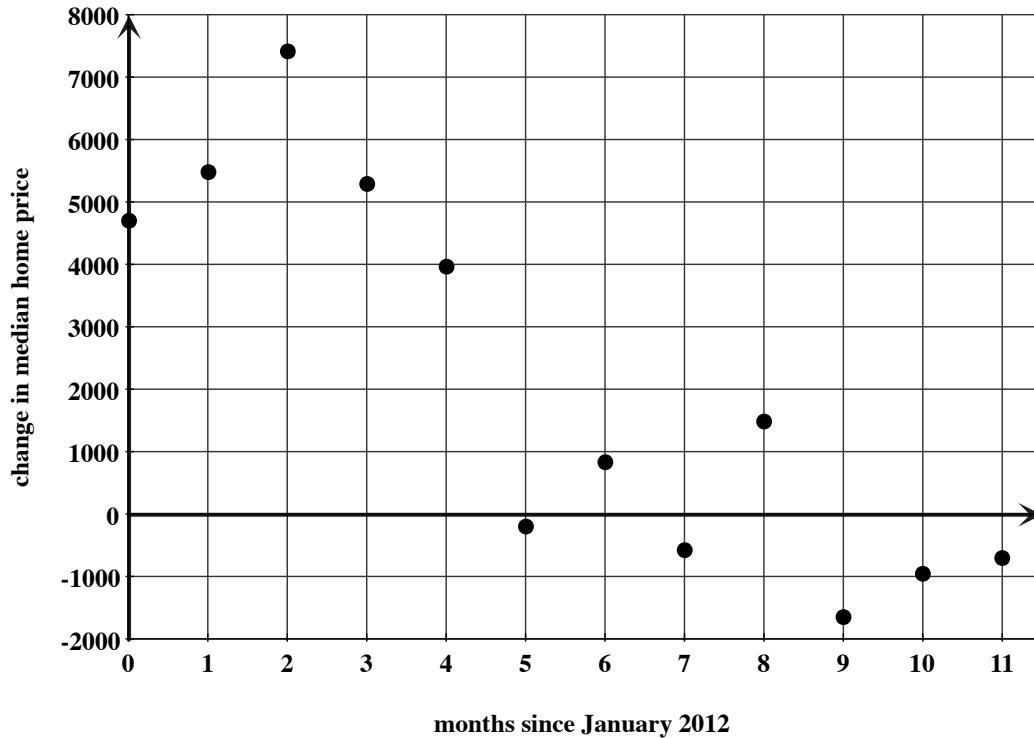
(a) For each of the following pairs of times, determine when the median home price was **higher**. If the answer cannot be determined from the available information, circle "cannot determine."

Was the median home price higher:

i. at $t = 2$ or $t = 3$?

ANSWER: (circle one) $t = 2$ $t = 3$ cannot determine

ii. at $t = 9$ or $t = 10$?

ANSWER: (circle one) $t = 9$ $t = 10$ cannot determine

iii. at $t = 11$ or $t = 12$?

ANSWER: (circle one) $t = 11$ $t = 12$ cannot determine

(b) Let $M(t)$ represent the median home price at time t months. Approximate $M(7) - M(5)$.

ANSWER: \$_____

(c) If the median home price at $t = 1$ was \$271,000, what was the median home price at $t = 0$?

ANSWER: \$_____

Version 1: In #1(a), you are producing 1000 Objects.

1. (a) (3 points) ~ 0.83 dollars per Object
   (b) (3 points) ~ 0.63 dollars per Object
   (c) i. (2 points) The graph of TR is a diagonal line with slope 1.50.
       ii. (4 points) ~ 2.5 hundred dollars
       iii. (2 points) $\overline{MR} = 1.50$ dollars per Object
       iv. (2 points) $q \approx 17$ hundred Objects

2. (a) (2 points each) (i) at $t = 3$; (ii) at $t = 9$; (iii) at $t = 11$.
   (b) (3 points) $M(7) - M(5) \approx \$800$
   (c) (3 points) $\sim \$266,200$

3. (3 points each)
   (a) $\dfrac{D(6+h) - D(6)}{h}$
   (b) the slope of the diagonal line through the graph of $D(t)$ at $t = 9.25$
   (c) $b \approx 5.8, 7.3$ seconds
   (d) $t \approx 6.3$ seconds

4. (5 points each) (a) $x > -\dfrac{4}{10}$; (b) after 4.75 months.

Version 2: In #1(a), you are producing 800 Objects.

1. (a) (3 points) ~ 1.27 dollars per Object
   (b) (3 points) ~ 0.70 dollars per Object
   (c) i. (2 points) The graph of TR is a diagonal line with slope 1.50.
       ii. (4 points) ~ 4.5 hundred dollars
       iii. (2 points) $\overline{MR} = 1.50$ dollars per Object
       iv. (2 points) $q \approx 18.5$ hundred Objects

2. (a) (2 points each) (i) at $t = 3$; (ii) at $t = 9$; (iii) at $t = 11$.
   (b) (3 points) $M(7) - M(5) \approx \$800$
   (c) (3 points) $\sim \$282,200$

3. (3 points each)
   (a) $\dfrac{D(7+h) - D(7)}{h}$
   (b) the slope of the diagonal line through the graph of $D(t)$ at $t = 6.75$
   (c) $b \approx 5.5, 8.4$ seconds
   (d) $t \approx 6.3$ seconds

4. (5 points each) (a) $x > -\dfrac{7}{8}$; (b) after 5.25 months.