Exam Review – Chapter 7 and Chapter 8

Summary of Main Topics:

1. Interpreting distance-time, position-time, speed-time, and velocity-time graphs.
2. Solving, graphing, and creating linear equations and inequalities, including parallel and perpendicular lines.
3. Solving systems of equations and inequalities (substitution, elimination).
4. Solving linear programming optimization problems, and other applications that can be modeled with linear equations, inequalities, and systems.
5. Factoring polynomials using the factor by grouping method and the CFQ method.
6. Solving quadratic equations by factoring, completing the square, and the quadratic formula.
7. Find the vertex of a parabola by completing the square and by using the formula x = -b/2a for the axis of symmetry.
8. Solving applications that can be modeled by quadratic functions, including finding the x-intercepts, y-intercept, and / or the vertex as needed to solve the problem at hand.

Selected problems:

Chapter 7 Test Review: (pp. 391 – 392) #1-3, 5-7, 11-13, 25-27, 29, 30, 33-35
Chapter 8 Test Review: (pp. 489 – 490) #3-6, 8, 9, 13, 14, 19, 24, 25.

Additional Problems & Topics:

7.6 Polynomials:

A. Factor $8x^2 - 10x - 3$ using two different methods: 1) by grouping and 2) using the CFQ method.

$ac = -24$
$b = -10$
use $(-12)(2)$!

Both methods use this

1) $8x^2 - 12x + 2x - 3$
$= 4x(2x-3) + (2x-3)$
$= (4x+1)(2x-3)$

2) $\dfrac{(8x - 12)(8x + 2)}{8}$
$= \dfrac{\cancel{4}(2x-3)\cancel{2}(4x+1)}{\cancel{8}}$
$= (2x-3)(4x+1)$

B. Determine whether or not the trinomial $6x^2 + 4x + 5$ is factorable. Is it possible to change one of the coefficients so that it will factor? (Be able to answer this two ways: What role might the discriminant ($b^2 - 4ac$) play in answering this question? What role might the product 6 x 5 = 30 play in answering this question?)

1) $b^2 - 4ac = 4^2 - 4(6)(5) = 16 - 120 = -104 < 0 \Rightarrow$ no roots, and not factorable!

2) $ac = 6 \cdot 5 = 30$. Factors of 30 are: $\underbrace{(1)(30)}_{31}$, $\underbrace{(2)(15)}_{17}$, $\underbrace{(3,10)}_{13}$, $\underbrace{(5)(6)}_{11}$.

We could use b = 31, 17, 13, or 11 (or the negatives) to get a factorable quadratic.

But since b = 4 is not among our sums, the quadratic is not factorable.

Solving Quadratic Equations:

C. Solve the equation $2x^2 - 2x - 3 = 0$ using three different methods: (1) Factor and ZPP, (2) Complete the square, and (d) Quadratic formula. Which seems to be the easiest for this particular problem?

1) Oops! It is not factorable, so scratch #1.

2) $2x^2 - 2x - 3 = 0$

$\Rightarrow \frac{2(x^2 - x)}{2} = 3/2$

$\Rightarrow x^2 - x = \frac{3}{2}$

$\Rightarrow x^2 - x + \frac{1}{4} = \frac{3}{2} + \frac{1}{4} = \frac{6}{4} + \frac{1}{4} = \frac{7}{4}$

$\Rightarrow \left(x - \frac{1}{2}\right)^2 = \frac{7}{4}$

$\Rightarrow x - \frac{1}{2} = \pm\sqrt{\frac{7}{4}} \Rightarrow x = \frac{1}{2} \pm \frac{\sqrt{7}}{2}$

d) $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(2)(-3)}}{2(2)}$

$= \frac{2 \pm \sqrt{4 + 24}}{4}$

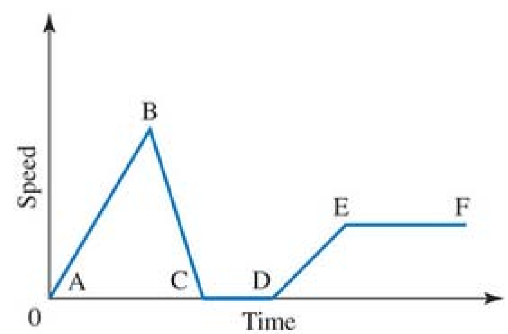
$= \frac{2 \pm \sqrt{28}}{4}$

$= \frac{2}{4} \pm \frac{\sqrt{4 \cdot 7}}{4}$

$= \frac{1}{2} \pm \frac{2\sqrt{7}}{4} = \frac{1}{2} \pm \frac{\sqrt{7}}{2}$

Interpreting Graphs:

D. Write a story that could be represented by the speed-time graph at the right.



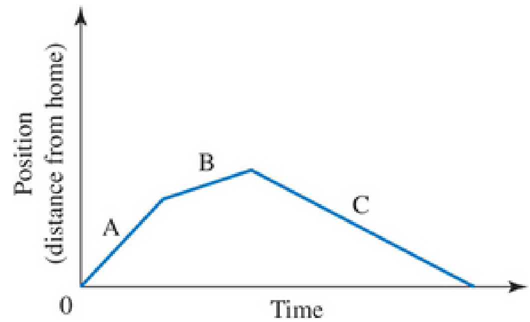
(Answers may vary.) On my drive to the airport, I accelerated steadily from a dead stop to a speed of 45 miles per hour. The stoplight turned red, so I hit the brakes and decelerated steadily until I reached a dead stop. I stayed there until the light changed again, then steadily accelerated until I reached the speed limit of 25 miles per hour, and I continued driving at that speed for a few minutes.

E. The graph at right represents Susan's position (distance from home) during her trip to the grocery store.

E1. During which segment of her journey did Susan walk the farthest? How do you know?

E2. During which segment of her journey did Susan take the longest? How do you know?

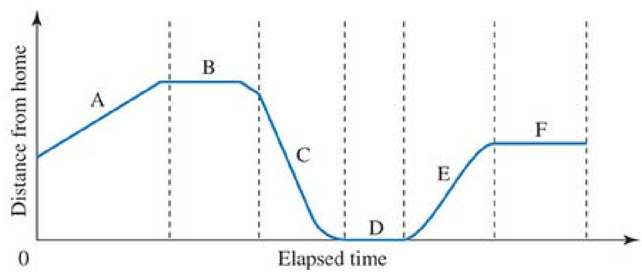
E3. During which segment of her journey did Susan travel the fastest? Explain why. Be sure to use distance and time in your argument. (Do not rely simply on a visual estimation of steepness.)



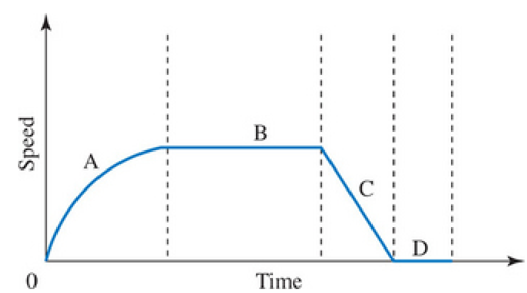
Abbreviated answers:
E1: Segment C – greatest change in y-coordinate.
E2: Segment C – greatest change in x-coordinate.
E3: Segment A – large change in y over a small change in x, so she traveled a fairly good distance in a short amount of time.

F. Tell a story about a journey that could be represented by each graph. Tell what happened in each lettered part of the graph. Be sure to talk about the speed represented by each part.

a.



b.

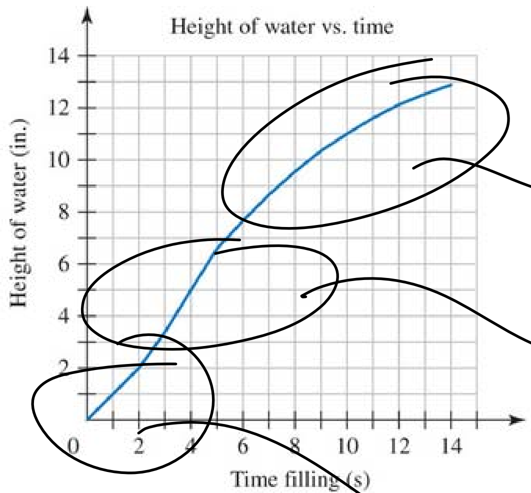


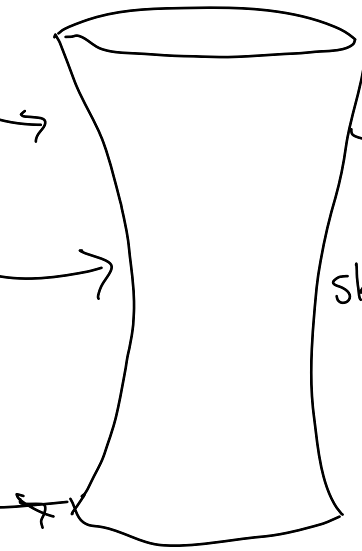
Answers may vary:

a. I left the library (which is 4 blocks from home) and started walking at a steady pace to the grocery store 4 blocks from the library. I entered the store to buy some fresh produce, then started walking home again. After a block or so my phone rang and my wife said she was having the baby, so I started running as fast as I could toward home! I got to my driveway and struggled up the steps to my house. We made preparations and I discovered my car's battery was dead, so I put her in a wheelbarrow and ran pushing her towards the hospital, which was only about five blocks away. We made it just in time and were admitted to our birthing room, where we waited until the baby was born!

b. I pulled out of my driveway on the way to the hospital, accelerating rapidly until I reached a speed of 70 miles per hour. I drove at that speed for a while when a police car lit me up and I slammed on the brakes so I could have the officer transport my wife to the hospital to deliver our baby!

G. A special vase is used for the bouquet of flowers at the head table. Below is a graph indicating the height of the water in the vase as it is being filled with water at a steady rate. Make a sketch of what the vase should look like.





filling slower and slower as it gets wider and wider,

skinny → filling quickly

filling somewhat slowly