

Math 34A Midterm 2 Practice Problems

Note: I didn't write the midterm so I don't know what type of problems will come up. But these four topics will appear on the test for sure. It is important that you understand how to do these problems so that even if they twist the problem a little bit on the test you would still be able to do it.

A. "Car problems"

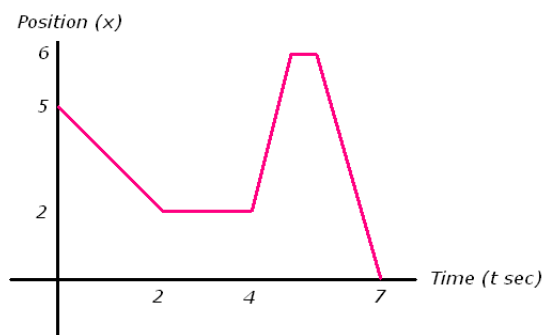
1. Two cars leave the origin at noon. One goes north at 60mph. The other goes south at 40mph. When are they 250 miles apart?

2. Car A and Car B leave Santa Barbara at the same time and travel along the same route. Both cars arrive at the end of the route after 6 hours. Car A goes at 40mph for the first 4 hours and then at 60mph for the rest of the time. Car B goes at 50mph for the first 2 hours and travels at a different constant speed for the remaining time. What is the speed with which car B travels the second part of the route?

*3. Car A leaves San Diego at 10am driving at 60mph along a route which is 500 miles long to San Francisco. Car B leaves San Diego 3 hours later traveling along the same route at 70mph. Will car B pass car A before they arrive at San Francisco? If yes, at what time?

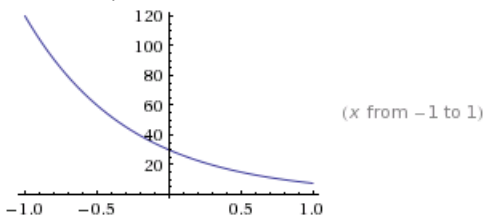
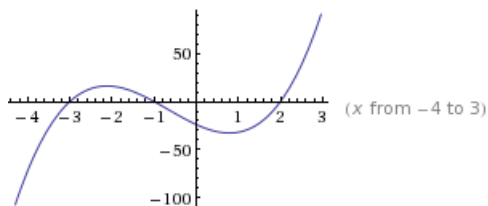
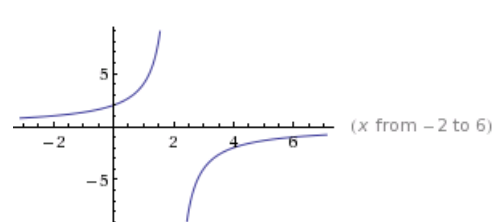
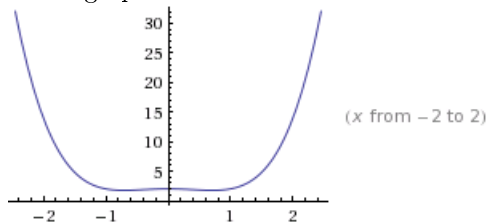
B. "Graphs"

4. A particle is moving along the x -axis. Its position is shown in a graph below as a function of time.



- What is the particle's initial position on the x -axis?
- On what time interval(s) is the particle stationary?
- What is the speed of the particle at $t = 1$? Is it moving towards the right or left at this moment?

*5. Consider the functions $f(x) = x^4 - x^2 + 2$, $g(x) = 30(4^{-x})$, $h(x) = 4(x + 1)(x - 2)(x + 3)$, and $k(x) = \frac{4}{2-x}$. Think of what special feature(s) their graphs would have. Use those features to match the functions with the graphs below.



C. “Express in terms of”

6. Let R be a rectangle whose area is twice its perimeter. Express its width in terms of its length.
7. An aquarium with a square base has no top. There is a metal frame. Glass costs $\$3/m^2$ and the frame costs $\$2/m$. The volume is to be $20m^3$. Express the total cost in terms of the height.
- *8. A circular swimming pool has radius 10m. Initially it is empty. Water is pumped in at a rate of 30000 liters per hour. Express the depth of water in the pool in terms of the number of hours the water is pumped. [there are 1000 liters in one cubic meter]
- *9. In a 6 acre apple orchard, it is decided to plant 20 or more trees per acre. If 20 trees are planted per acre then each mature tree will yield 600 apples per year. For each additional tree planted per acre, the number of apples produced by each tree decreases by 12 per year. Express the total number of apples produced per year in terms of the number of trees per acre.

D. “Lines”

10. Find the equation of the line that passes through the point $(-1,3)$ and is parallel to the line $y = 2x - 4$.
11. Find the equation of the line that goes through the origin and is perpendicular to the line $y - 4 = \frac{1}{3}(x - 3)$.
- *12. John’s house is located at the point $(-3,-5)$ on the plane (the unit of the coordinates is in miles). His school is 6 miles north and 8 miles east of his house. There is a convenience store 1 miles south and 2 miles west of the school. If John walks in a straight line from his house to the school, will he pass the convenience store on his way?