Practice Midterm Exam Questions

Table One		Table Two	
A	**B**	**C**	**D**
0	2	1	3
1	3	2	6
2	3	3	9
3	4	4	12

1. For each of the given (input, output) relationships in Tables One and Two; answer the following: Is the relationship a function? Why or why not?
   a. A a function of B
   b. B a function of A
   c. C a function of D
   d. D a function of C

   For the relationships that are functions; also answer:
   i. What is the domain of the function?
   ii. What is the range of the function?

2. What is the domain and range for each of the following functions? Show your work for determining the domain when applicable. You may find graphing the function or using the calculator table feature for the function to be helpful; especially for determining the range. If you do so, include a sketch of the graph (label key points).

   a. $f(x) = \dfrac{1}{3x - 3}$
   b. $f(x) = \dfrac{1}{1 + x^2}$
   c. $f(x) = \sqrt{5x - 10}$
   d. $f(x) = \dfrac{1}{\sqrt{4 - x^2}}$
   e. $f(x) = \dfrac{1}{\sqrt{4x - 2}}$
   f. $y = \sqrt{(x - 2)^3}$

3. Use the provided graph of Eugene's bike trip to answer the following questions: Be sure you can find equations of any of the requested lines.
   a. When is Eugene taking a break? How do you know?
   b. When is Eugene going away from or towards his house? How do you know?
   c. When is Eugene going faster and faster? Explain how you know using calculus concepts.
   d. When is Eugene going slower and slower? Explain how you know using calculus concepts.
   e. When is Eugene going at a constant rate and what are his speeds in mph during those times? Explain how you know using calculus concepts.
   f. When is Eugene going the fastest and how fast, in mph is he going? Which calculus concept does this relate to?
   g. What is Eugene's average speed, in mph, during the first 45 minutes of his trip? The second 45 minutes? Which calculus concept does this relate to?
   h. When is Eugene's average speed 9 mph, 12 mph, 15 mph? Which calculus concept does this relate to?
   i. When is Eugene's speed 9 mph, 12 mph, 15 mph? Which calculus concept does this relate to?

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4. Suppose a rock is thrown into the air and its height in feet at time t seconds is given by $h(t)=-16t^2 + 20t + 6$.
   a) What is the initial height of the rock?
   b) When does the rock hit the ground?
   c) How fast is the rock going when it hits the ground?

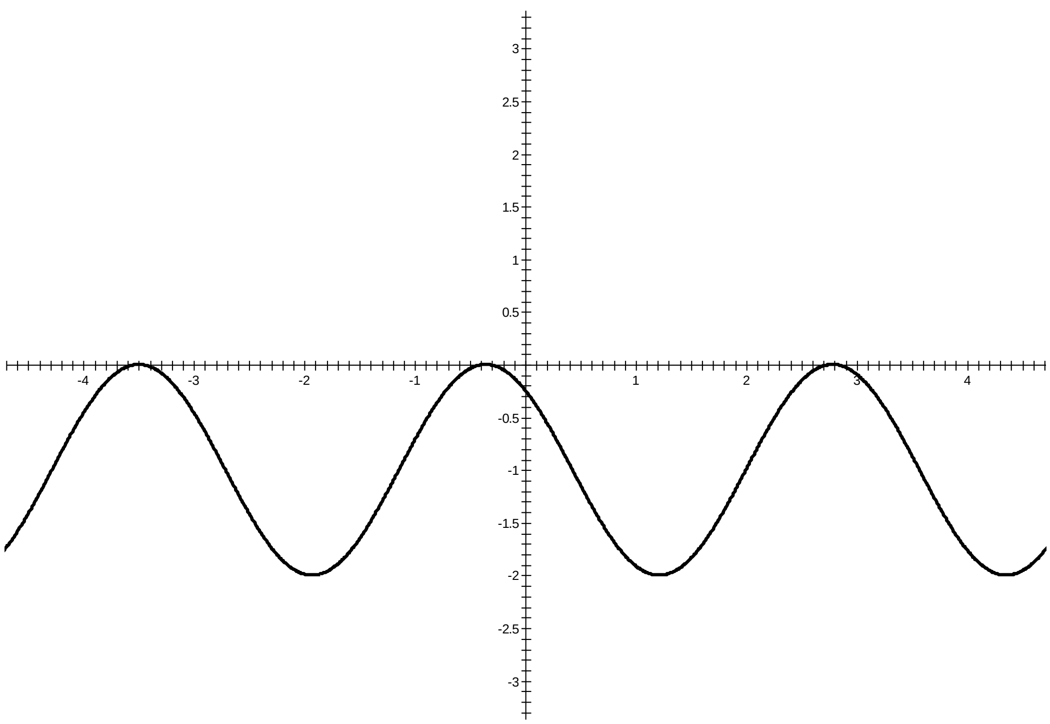
5. Use <u>**Fermat's Method**</u> to compute the derivatives of $f(x) = 5x^2 + 1$ and $f(x) = 2 - x^3$. Carefully show all of your steps.

6. For each of the following, use the Power, Constant Multiple and Sum Rules (as appropriate) to determine $f'(x)$. Carefully show your work, don't skip steps. Give your answers without negative exponents.

   a. $f(x) = \dfrac{1}{2x^3}$ b. $f(x) = \sqrt[3]{x^2}$ c. $f(x) = 17x^5 - 22x^3 + \pi$

7. For each of the following functions, sketch the graph of the derivative on the same axes. Carefully mark all key points on the graphs and/or axes and explain your work. Use key terms in your explanations. Label your curves $f(x)$ and $f'(x)$

Key Terms		
	Function	↑, ↓, local max, local min, concave up, concave down
	Derivative	> 0, < 0, = 0, ↑, ↓



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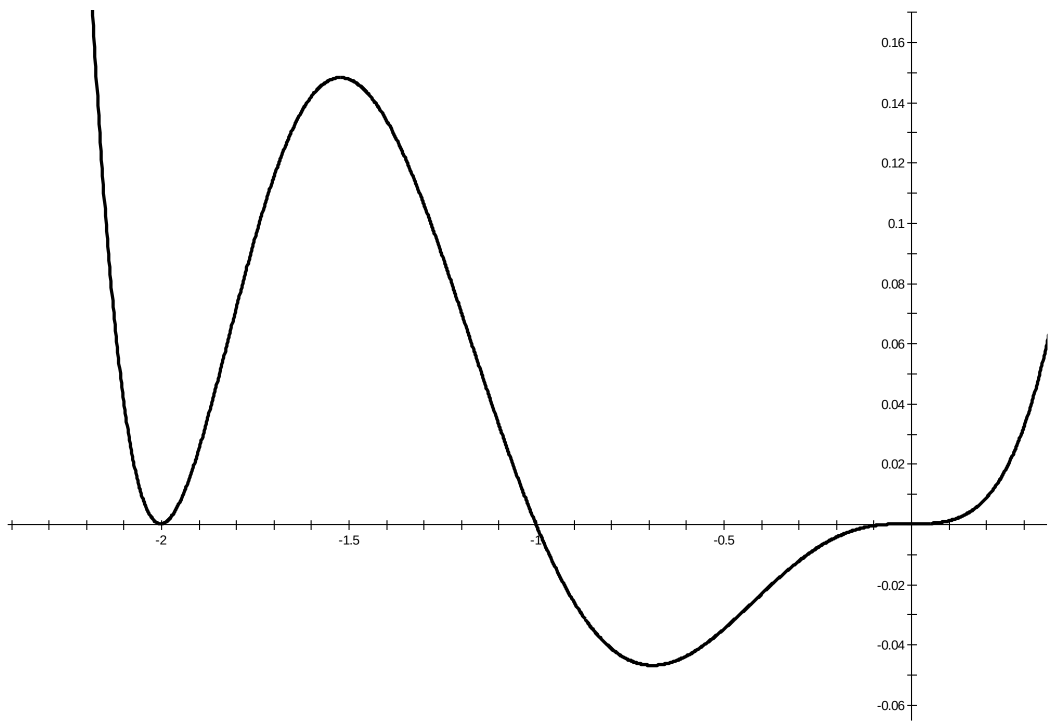

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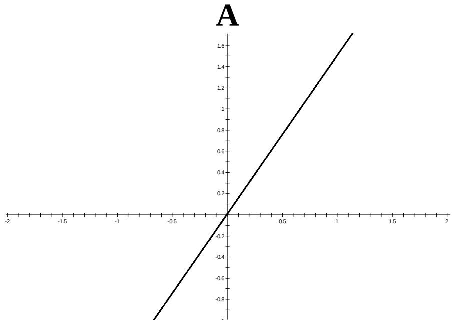
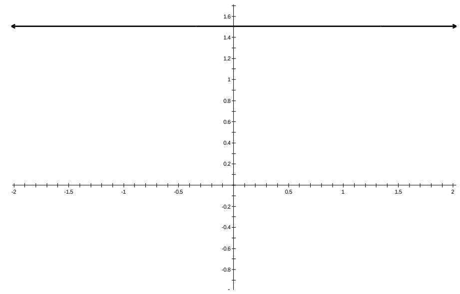
8. Identify as many relationships (graph A is the derivative of graph _____ and the function for graph ___, etc.) as possible. Explain your responses using key terms.

Key Terms	**Function**	↑, ↓, local max, local min, concave up, concave down
	Derivative	> 0, < 0, = 0, ↑, ↓

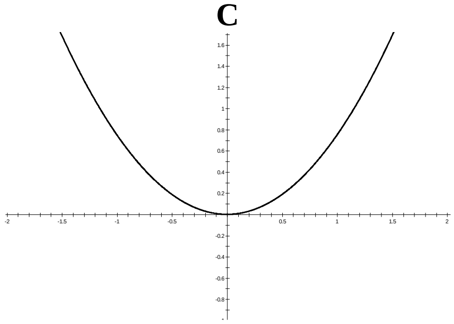
A



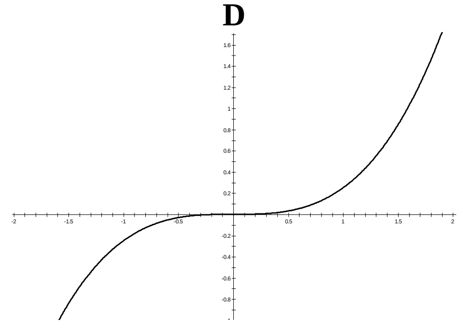
B



C



D



9. Consider $f(x) = x^3 - x$. Find all local max, min and infection points of this function and then sketch the graph of the derivative of $f(x)$ on the same axes. Carefully mark all key points on the graphs and/or axes and explain your work. Use key terms in your explanations. Label your curves $f(x)$ and $f'(x)$