Exam # 2 Sample Review
Sections 2.1-2.4, 3.1-3.5, and 4.1-4.3

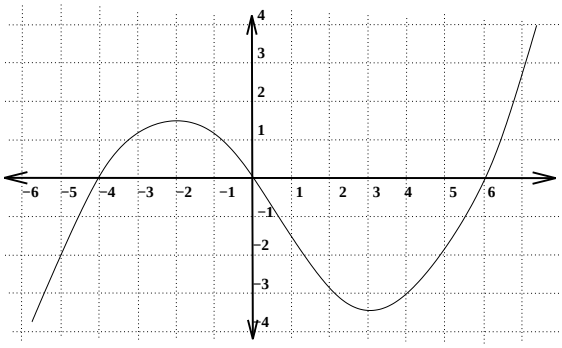
This collection of questions is intended to be a brief overview of the material on the exam. This is not intended to represent an actual exam. When studying, you should also look at the homework problems in the book as well as the other week in reviews for this material.

1. Let $f(x) = 5x^3 - 8x^2 + x + 70$
   (a) Find all critical values of $f(x)$ and classify them as local max, local min, or neither.
   (b) Find the inflection values.
   (c) Find the interval(s) where $f(x)$ is decreasing and concave down.
   (d) Find the interval(s) where $f(x)$ is increasing and concave up.
   (e) Find the global maximum and global minimum of $f(x)$ on the interval $[0, 6]$
2. Let $f(x) = 2x^4 - 10x^3 + 10$.
   (a) Find the intervals where $f(x)$ is increasing and where it is decreasing. Classify the critical values.
   (b) Find the intervals where $f(x)$ is concave up and where it is concave down. Find the x-values of the inflection points.
   (c) Does the function have a global max? If so, where?
   (d) Does the function have a global min? If so, where?
   (e) Does the function have a global max on the $[1, 4]$? If so, where?
3. Find the x-values of the inflection points for $f(x)$ if the domain of $f(x)$ is all real numbers and $f''(x) = 3x^2(x + 6)(7 - x)^3$
4. Find the constants a and b such that the point $(1, -4)$ is an inflection point for $f(x) = ax^3 + bx^2 + 10$.
5. For problem 4, is the critical value that is less than 1 a local max or a local min? Answer this question without performing any calculations or using the graphing calculator.
6. Find the global max and the global minimum for $y = 12 - 7\cos(3x)$
7. Give the formula for a function that has a global maximum but doesn't have a global minimum.
8. Let $f''(x) = 6x - 15$. What can be concluded about the following values of x.
   (a) $x = 3$
   (b) $x = 5$ if $f'(5) = 0$
   (c) $x = 0$ if $f'(0) = 0$

9. Sketch a graph of a function that has these properties.
   $f(x)$ is continuous for all real numbers.
   $f(x) < 5$ for all real numbers.
   $f'(2) = 0$ and $f(2) = 1$
   $f'(x) < 0$ on $(-\infty, 0)$
   $f'(x) > 0$ on $(0, 2)$ and $(2, \infty)$
   $f''(x) < 0$ on $(-\infty, 0)$ and $(0, 2)$ and $(4, \infty)$
   $f''(x) > 0$ on $(2, 4)$

10. The value of a van purchased in 2005 can be approximated by the function $V(x) = 25(0.85)^x$, where x is time in years from 2005, and V is the value in thousand of dollars. Evaluate $V'(4)$ and interpret the result.

11. Use the graph to answer these questions.



    (a) If the graph is of $f'(x)$, where is $f(x)$ increasing and concave up?

    (b) If the graph is of $f'(x)$, where does $f(x)$ have a local minimum?

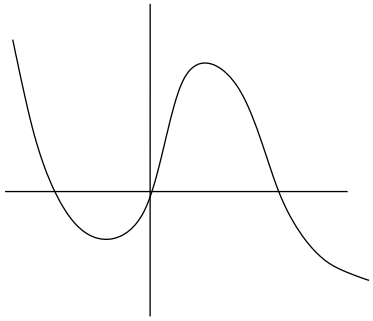
    (c) If the graph is of $f'(x)$, where does $f(x)$ have inflection points?

    (d) If the graph is of $f''(x)$, where is $f(x)$ concave up?

12. Find the equation of the tangent line $y = \ln(x^3 - 7) + e^{x^2-4}$ at $x = 2$

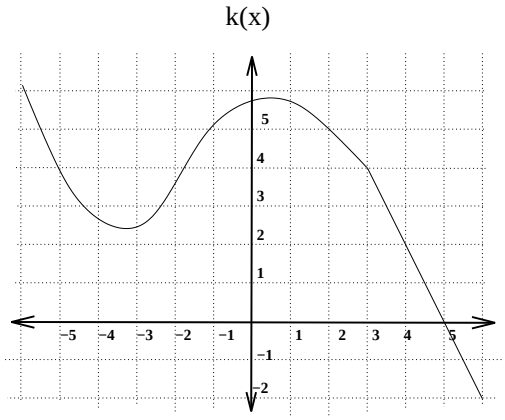
13. Find $f''(x)$ for $f(x) = e^{x^2+4x}$

14. Sketch the graph of the 2nd derivative for this function.



15. Let $f(x)$ and $g(x)$ whose values and derivative values are given by the table. Let $k(x)$ be the function given in the graph. Use this information to compute the following.

x	0	1	2
$f(x)$	1	-1	4
$f'(x)$	2	4	6
$g(x)$	-1	2	3
$g'(x)$	5	3	5



(a) If $M(x) = \cos(f(x))$, find $M'(0)$

(b) If $H(x) = x^2 - (k(x))^3$, find $H'(4)$

(c) If $J(x) = k(x)g(x^2)$, find $J'(-1)$

(d) If $N(x) = \dfrac{f(x) + 2x}{g(x)}$, find $N'(2)$