

Week in Review # 7

MATH 142
Sections 5.1, 5.2, 5.4

Drost-Spring 2010
March 7, 2010

1. Determine the intervals over which the function, $f(x) = \frac{x-8}{4x}$, is increasing/decreasing?

2. Determine the intervals over which the function, $g(x) = e^{x^2-9}$ increasing/decreasing?

3. The concentration of pain killer in the blood stream t hours after taking the medicine is given by $C(t) = \frac{(t+3)^2}{t^2-4t+10}$, where $C(t)$ is measured in mg/ml . How many minutes before the pain killer has reached it's maximum concentration?

4. Find the intervals over which $f(x)$ is increasing when $f(x) = \frac{x-4}{x^2+x-2}$

5. Find the intervals over which $h(x)$ is decreasing **AND** concave up, when $h(x) = \ln\left(\frac{x^2+1}{x^2+4}\right)$

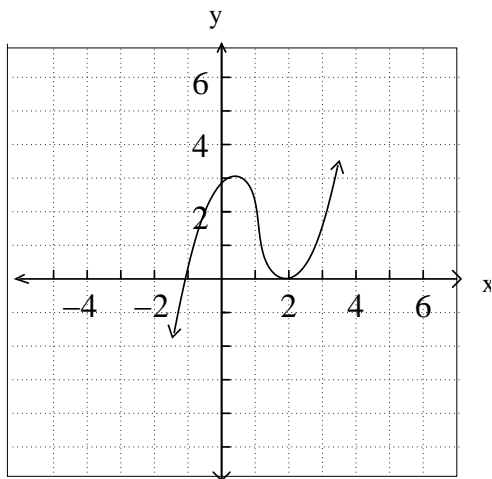
6. Find the critical values for

a. $f(x) = \frac{3x^2+x-2}{x^2-1}$

b. $g(x) = \frac{-2x}{x^2+12}$

7. From the graph below of $f'(x)$,

- Where is $f''(x) > 0$?
- Where is $f(x)$ increasing?
- Where does $f(x)$ have a relative max or min?
- Where does $f'(x)$ have a point of inflection?



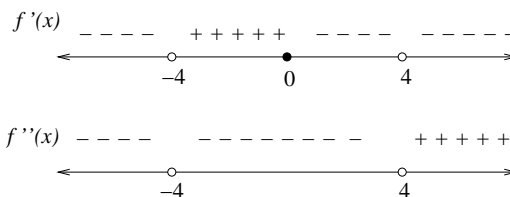
8. Sketch the graph of a function f that satisfies the following:

Domain: $(-\infty, 4) \cup (4, \infty)$

Vertical asymptotes: $x = 4$

Horizontal asymptote: $y = -2$

x -intercepts: $(6, 0)$; y -intercept: $(0, -3)$



9. Sketch the graph of a function f that satisfies the following:

Domain: All real numbers where $x \neq -3$

x -intercepts: $(-2, 0)$ and $(2, 0)$

y -intercept: $(0, 4)$

Vertical asymptotes: none

$\lim_{x \rightarrow -\infty} f(x) = \infty$ and $\lim_{x \rightarrow \infty} f(x) = 0$

$f'(x) > 0$ on $(-2, 0) \cup (4, \infty)$

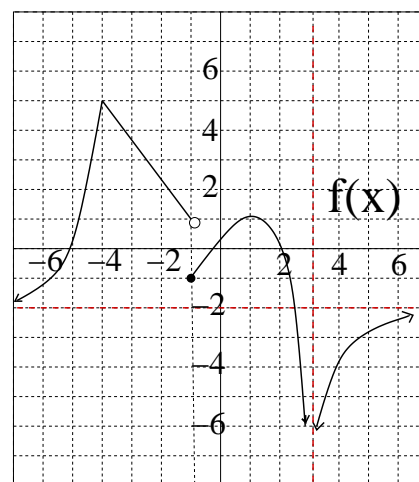
$f'(x) < 0$ on $(-\infty, -3), (-3, -2) \cup (0, 4)$

$f''(x) > 0$ on $(-\infty, -3) \cup (-3, -1) \cup (1, 6)$

$f''(x) < 0$ on $(-1, 1) \cup (6, \infty)$

10. Use the graph below to find the absolute extrema (locations and values) of $f(x)$ on each of the intervals below.

- $[-5, 0]$
- $[-1, 2]$
- $[1, 5]$
- $(0, \infty)$
- $(-\infty, -1)$



11. Find the absolute extrema (locations and values) of $f(x) = x^2 e^{-0.5x}$ on

- $[-3, 2]$
- $[-2, 3]$

Find all local extrema of each of the given functions on its domain. Use the Second Derivative Test when it applies.

12. $f(x) = x^4 - 4x^3 - 80x^2 - 120$

13. $g(x) = -0.2x + \ln(5x - 20)$

14. $h(x) = 2x^5 - 15x^4 - 90x^3 + 75$

Each of the following functions has one absolute extremum on the provided interval. Find the location and value of the absolute extremum and classify it as an absolute maximum or absolute minimum.

15. $f(x) = \frac{2x}{e^{0.5x}}$ on the interval $(0, \infty)$

16. $g(x) = -2x * \ln x + 4x$ on the interval $(0, \infty)$

17. $h(x) = 10 - 2x - \frac{12}{x^2}$ on the interval $(0, \infty)$

18. Darcy's Garden Center estimates that it will sell $N(x)$ units of a product after spending x thousand dollars on advertising, when $N(x) = -x^4 + x^3 - 12x^2 - 2x + 10$. When is the rate of change of the product increasing and when is it decreasing? What is the point of diminishing returns?

19. *Inventory Control* - Nan's Grand Pianos sell 480 grand pianos during the year. Their supplier charges Nan \$2600 for each piano, plus a shipping and handling charge of \$675 for each order placed. The Warehouse Around The Corner charges Nan \$720 to store a piano for a year. Let x represent the number of pianos ordered each time.

a. Find the expression which represents the cost of one order.

b. Find the expression for the storage costs.

c. Find the function, C_I , which represents the inventory costs.

d. How many pianos should Nan order at one time to minimize inventory costs?

20. Apply the graphing strategy to sketch the graph of $f(x) = \frac{3x^2 - 10x + 8}{x^2 - 4}$.

21. Find **ALL** asymptotes for each of the following functions:

a. $f(x) = \frac{2x^2 - 5x + 10}{x - 1}$

b. $g(x) = \frac{5x^2 - 14x - 3}{2x^2 - 18}$

c. $h(x) = 4x + 5 - \frac{2x}{x^2 - 10}$

d. $F(x) = \frac{4x^3 - 6x^2 + 2}{x^2 + 4}$

22. Let $S(t) = -0.005t^4 + 0.04t^3 + 1.8t^2 + 25t$ represent the salary you are offered on your first job after graduation from A&M, in hundreds of dollars. Over what intervals is the rate of change of Salary negative? Define t as the number of years working at this job.