

Math 1431 Test 3 Review

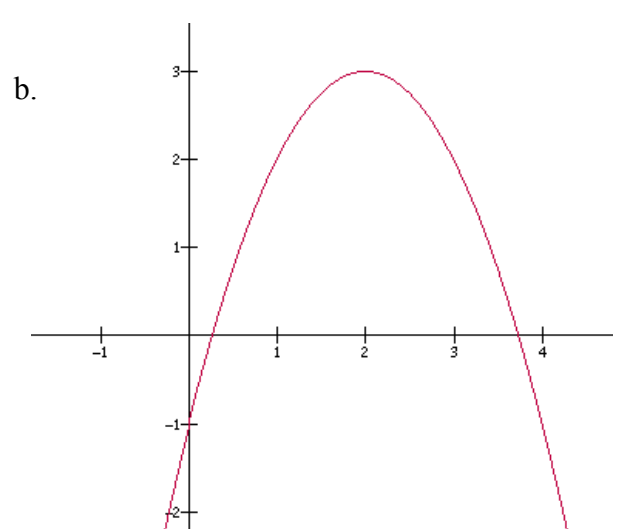
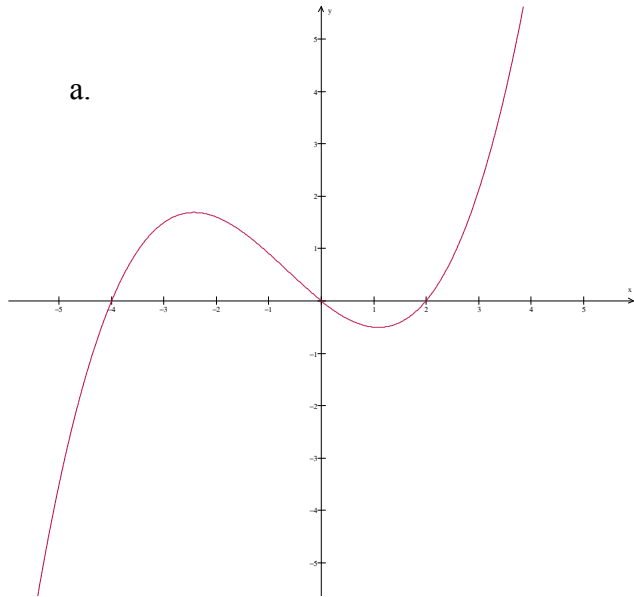
1. Find the critical numbers of f and classify the extreme values given $x \in [-3, 1]$

$$f(x) = \frac{x}{x^2 + 4}$$

2. Find all local extreme and intervals of increasing and decreasing for

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

3. Each of the graphs below are graphs of f' . Determine where f is increasing, decreasing, intervals of concave up and concave down. List all local maximum and minimums and points of inflection.



4. The value $x=a$ is a critical number for $f(x)$, Classify a as a local maximum, local minimum or neither.

a. $f(x) = x^3 - 12x^2, x = 8$

b. $f(x) = \frac{1}{4}x^4 + x^3 - \frac{3}{2}x^2 - x + 4, x = 1$

5. Consider the function $f(x) = 3x^4 - 20x^3 + 42x^2 - 36x$ on the interval $[0, 4]$.

a. Show that the critical numbers of f are 1 and 3.

b. Give the interval(s) of increase and decrease of f .

c. Give the value(s) of x at which f has either a local minimum or a local maximum.

- d. Give the values of x at which f has an absolute minimum or an absolute maximum.
- e. Give the interval(s) where the graph of f is concave up.
- f. Give the interval(s) where the graph of f is concave down.
- g. Give the values of x where the graph of f has inflection.
- h. Plot f .

6. Graph a function f which has a cusp at $x = 1$, a vertical tangent line at $x = 2$, a horizontal asymptote of 3, and vertical asymptotes at $x = -2$ and $x = 3$.
7. List the domain, critical numbers, intervals of increase, intervals of decrease, inflection points, intervals of concave up, and intervals of concave down for the function given. Then graph the function and carefully label any local maximums, local minimums or points of inflection.

$$f(x) = -2x^3 + 3x^2 + 12x - 3$$

8. Determine if the following are one-to-one, if so, find $f^{-1}(x)$

- a. $f(x) = x^3 + 1$

- b. $f(x) = 3x + 10$

- c. $f(x) = \sqrt{9 - x^2}$

9. Suppose f has an inverse, $f(3) = 1$ and $f'(3) = \frac{2}{7}$. Find $(f^{-1})'(1)$.

10. Suppose $f(x)$ is an invertible differentiable function and the graph of f passes through the points $(6, -1)$ and $(-1, 2)$. The slope of the tangent line to the graph of f at $x = -1$ is $7/2$. Find the equation of the tangent line to the inverse of f at 2.

11. Find $(f^{-1})'(a)$ if $f(x) = x^3 + 1$ and $a = 9$

12. Find the derivative:

- a. $y = \ln \sqrt{e^x + 4x}$

- b. $y = \sin(\ln(5-x)^6)$

- c. $y = x^2 e^{2x} + \ln e^{2x}$

- d. $f(x) = \ln(\sec \sqrt{x})$

- e. $f(x) = \frac{e^{\sqrt{x}}}{x^3}$

- f. $y = (\cos x)^{(x+7)}$

- g. $f(x) = (3x - 1)^{2x+6}$

- h. $f(x) = \log_7(3x^2)$

- i. $y = 6^{-2x}$