

Math 160 - Test #1 Info and Review Exercises

Fall 2018, Prof. Beydler

Test Info

- Date: Thursday, September 27, 2018
- Will cover packets #1 to #11.
- You'll have the entire class to finish the test.
- This will be a 2-part test. Part 1 will be **no calculator**. Part 2 will be **scientific calculator only**.
- No notes, no books, no phones during the test.
- There will be a seating chart for the test.
- Where to get help as you're studying:
 - Office hours
 - TMARC, LAC, or other tutoring centers
 - E-mail me at dbeydler@mtsac.edu

Review Exercises

Note: If you write up solutions to all of the review exercises listed below, and hand them in at the test, you can earn up to 2% extra credit towards your test! It is important to understand that these review exercises are not guaranteed to cover all of the potential problems on the test. Please review the notes, previous quizzes, and homework problems to fully prepare for the test.

Types of problems that will appear on Part 1 are labeled **NC** (for **No Calculator**).

1. Find the domain of each of the following functions. (**NC**)

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

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

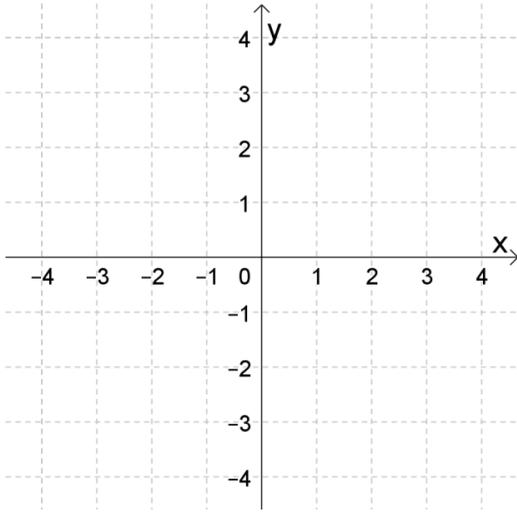
2. Find $\frac{f(x+h)-f(x)}{h}$ and simplify by canceling the factor of h . (NC)

a) $f(x) = \sqrt{2x - 1}$

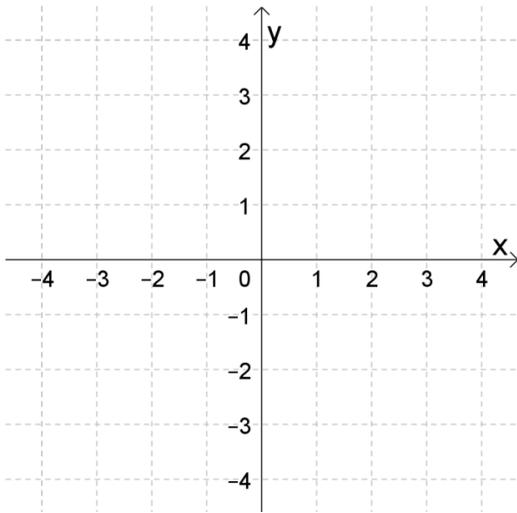
b) $f(x) = \frac{1}{x+1}$

3. Graph the following functions. Be sure to describe the transformations to the basic function. (NC)

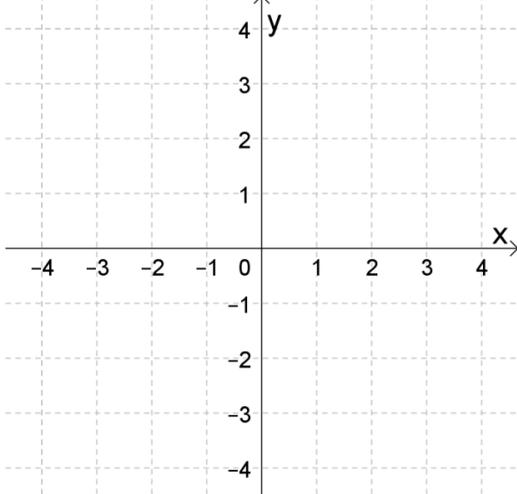
a) $f(x) = |-2x - 3| - 1$



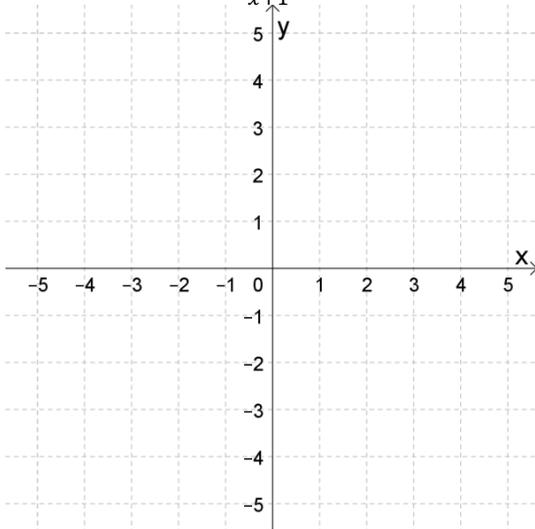
b) $f(x) = -\frac{1}{2}(x + 2)^2 + 3$



c) $f(x) = -2\sqrt{3-x}$

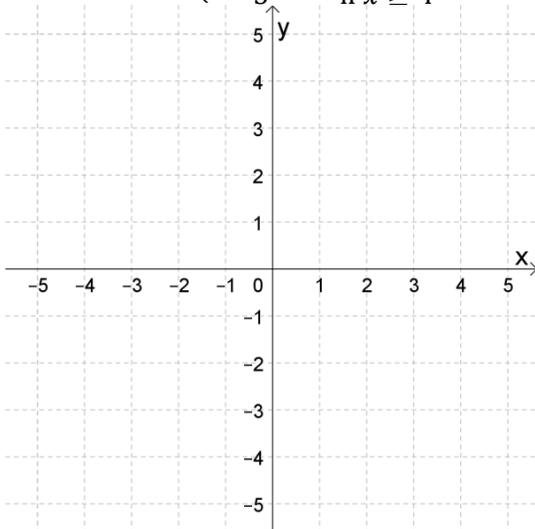


d) $f(x) = 3 - \frac{1}{x+1}$

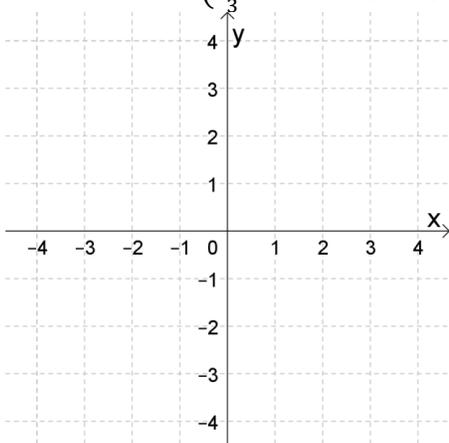


4. Graph the following functions. (NC)

a) $f(x) = \begin{cases} -2x + 1 & \text{if } x < -1 \\ |x - 1| & \text{if } -1 \leq x < 4 \\ 5 & \text{if } x \geq 4 \end{cases}$



b) $f(x) = \begin{cases} \sqrt{-x} + 2 & \text{if } x < 0 \\ 3 & \text{if } x = 0 \\ \frac{1}{3}x + 1 & \text{if } x > 0 \end{cases}$

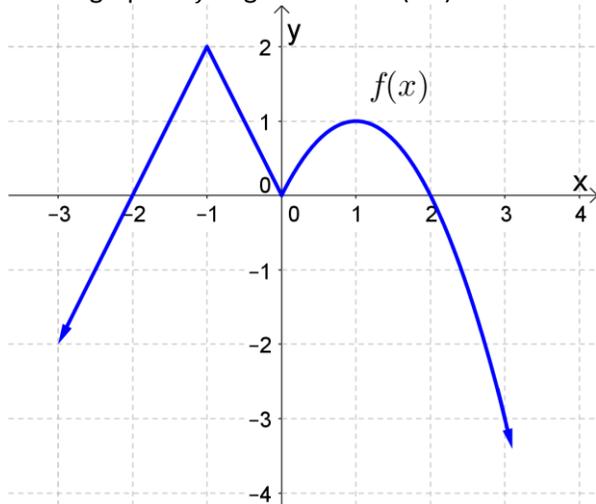


5. Determine whether each of the following functions is even, odd, or neither. Be sure to show how you got your answer. (NC)

a) $f(x) = x^4 - |x|$

b) $f(x) = 3x^5 + x^2$

6. The graph of f is given below. (NC)



a) Determine the intervals on which f is increasing and decreasing.

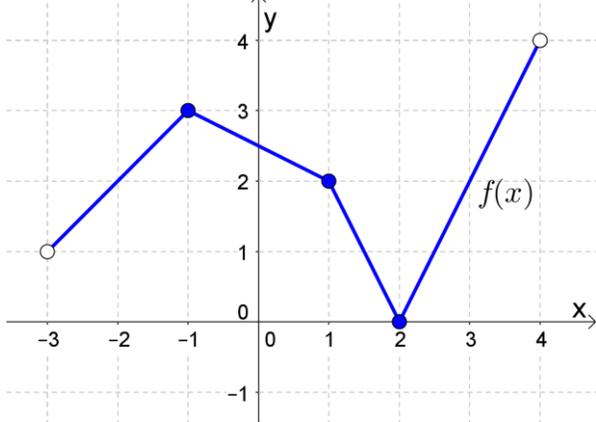
b) Find all local maxima and minima. Write your answers in the form $f(123) = 456$.

c) Find the absolute maximum and absolute minimum of f , if any. Write your answers in the form $f(123) = 456$.

d) Find the domain of f . _____

e) Find the range of f . _____

7. The graph of f is given below. (NC)



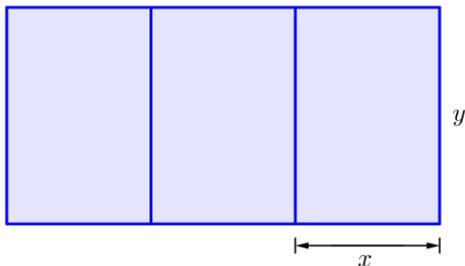
- Determine the intervals on which f is increasing and decreasing.
- Find all local maxima and minima. Write your answers in the form $f(123) = 456$.
- Find the absolute maximum and absolute minimum of f , if any. Write your answers in the form $f(123) = 456$.
- Find the domain of f . _____
- Find the range of f . _____

8. Find the average rate of change of $f(x) = x^3 - 2x + 5$ between $x = -2$ and $x = 1$.

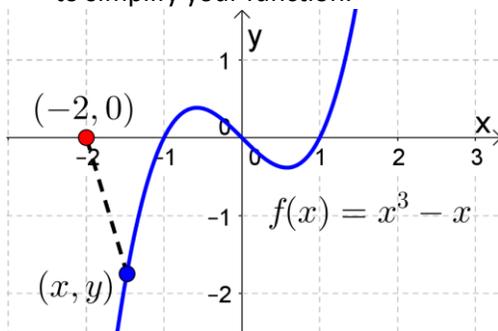
9. Find the average rate of change of $f(x) = \frac{2}{x-1}$ between $x = 3$ and $x = 5$.

10. You buy a 500-square-foot, rectangular piece of property with one side against a straight highway. You'd like to protect your property with fencing. Most of the fencing costs \$4 per foot, but the fencing next to the road must be sturdier and costs \$6 per foot. Find a function in one variable that models the cost of fencing the property.

11. A rectangular plot of land is going to be divided into three adjacent, equal-sized playgrounds (see diagram). If the total number of feet of fencing is 200, find the area enclosed by all three playgrounds as a function of x . (Note: there is only one fence between each pair of playgrounds, not two.)



12. Find the distance from the point $(-2, 0)$ to the polynomial $f(x) = x^3 - x$ as a function of x only. Be sure to simplify your function.

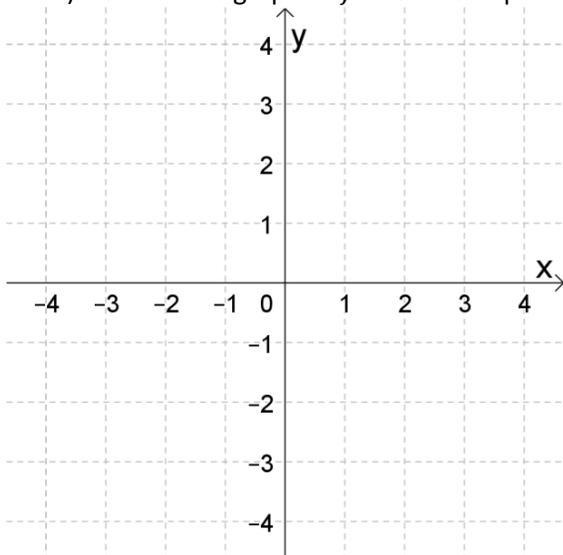


13. Let $f(x) = \frac{1}{2}x^2 + 2x - 1$.

a) Express f in standard form.

b) Find the vertex of f . _____

c) Sketch the graph of f . Be sure to plot the vertex and y -intercept.



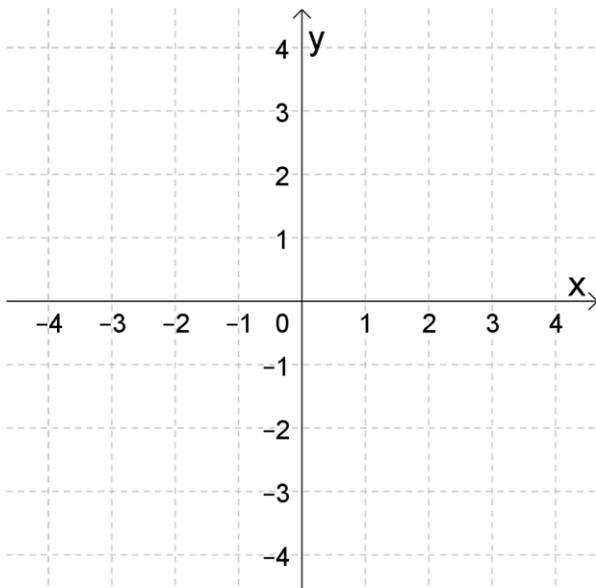
d) Find the maximum or minimum value of f .

e) Find the range of f . _____

14. Let $f(x) = -3x^2 + 6x - 1$.
- a) Express f in standard form.

b) Find the vertex of f . _____

c) Sketch the graph of f . Be sure to plot the vertex and y -intercept.



d) Find the maximum or minimum value of f .

e) Find the range of f . _____

15. You have 100 ft of fencing and would like to fence off a rectangular plot of land next to a straight river. Assuming you don't need to fence off the side next to the river, find the dimensions that would maximize the area of your plot of land. What would the maximum area be?
16. A cannon shoots a cannonball from the top of a tower that is 10 meters high. The height of the cannonball t seconds later is given by the function $y(t) = 10 + 49t - 4.9t^2$ (in meters). What is maximum height attained by the cannonball? When does this happen?

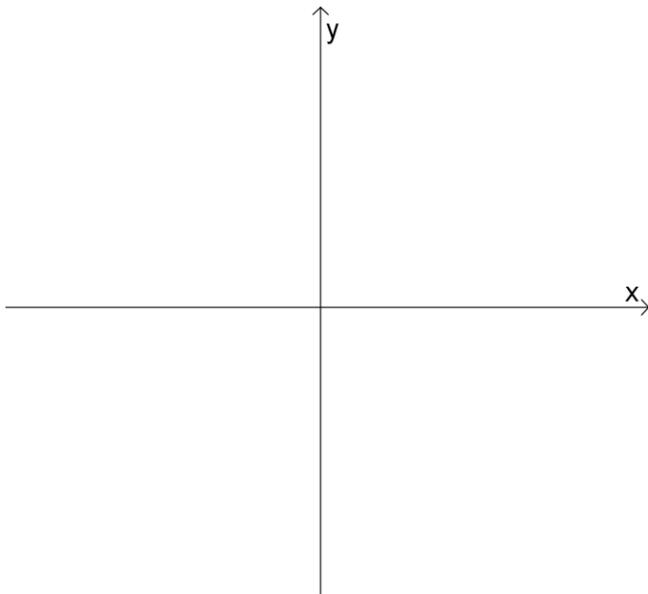
18. Let $f(x) = \frac{1}{3}x(x - 2)^2(x + 2)$.

- a) Find the x -intercept(s) and the y -intercept of f .

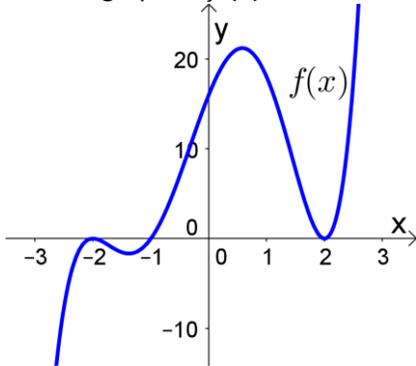
- b) Find a test point between the x -intercepts of f , as well as a test point before the first x -intercept, and a test point after the last x -intercept.

- c) Determine the end behavior of f .

- d) Sketch the graph of f .



19. The graph of $f(x)$ is shown below. (NC)



a) Find the zeros of f , and for each zero determine if the multiplicity is even or odd.

b) How many turning points does f have? _____

c) What is the smallest possible degree of f ? _____

d) Determine the end behavior of f .

20. Divide using long division: $\frac{2x^5 + 3x^4 - x^2 + 5x - 7}{x^3 - x^2 - 3}$ (NC)

21. Divide using synthetic division: $\frac{2x^4+x^3-6x^2+7x+1}{2x+1}$ **(NC)**

22. Use the Factor Theorem to show that $x - 2$ is a factor of $P(x) = 3x^3 - 7x^2 + 4x - 4$.

23. Find the complete factorization and all zeros of the following polynomials. **(NC)**

a) $P(x) = 3x^5 + 11x^4 + 26x^3 + 26x^2 + 3x - 5$

b) $P(x) = x^4 + x^3 - 18x^2 + 14x + 20$

c) $P(x) = x^6 - 3x^5 + 4x^4 - 8x^3 + 16x$

24. Find a degree 4 polynomial with zeros -2 (multiplicity 2) and $3 - i$. (NC)

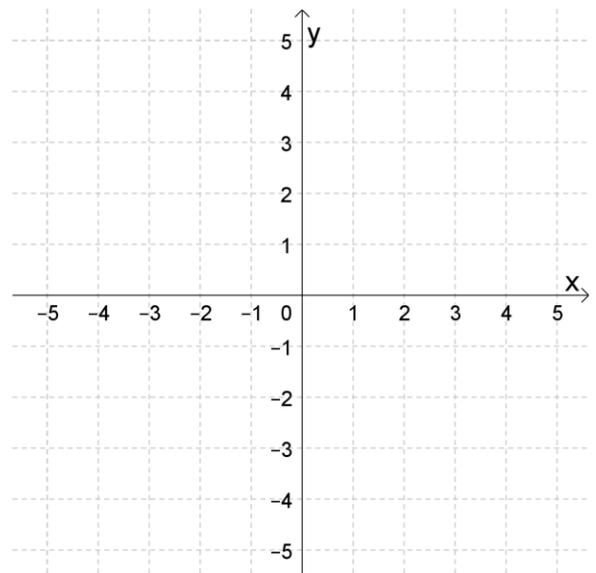
25. Let $f(x) = \frac{2(x+1)^3}{(x+2)^2(x-2)}$.

a) Find the domain of f . _____

b) Find the x -intercept(s) and y -intercept of f (if any).

c) Find all vertical, horizontal, and slant asymptotes of f . If none, write "none". Also, be sure to show your analysis on each side of each vertical asymptote (if any).

d) Sketch the graph of f .



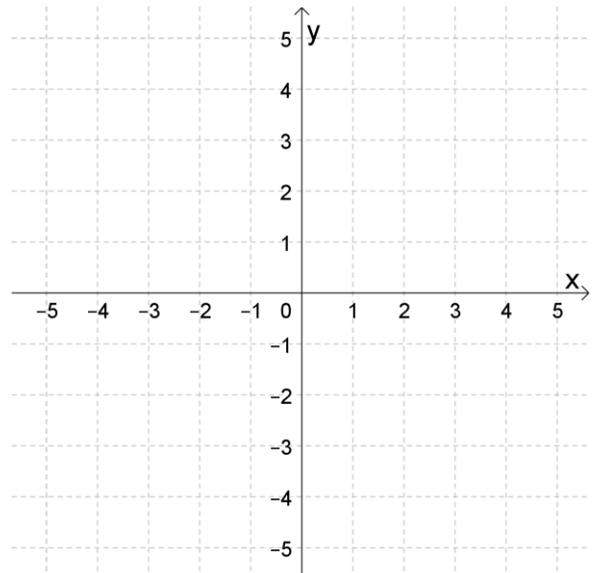
26. Let $f(x) = \frac{2x}{x^2 - 6x + 9}$.

a) Find the domain of f .

b) Find the x -intercept(s) and y -intercept of f (if any).

c) Find all vertical, horizontal, and slant asymptotes of f . If none, write "none". Also, be sure to show your analysis on each side of each vertical asymptote (if any).

d) Sketch the graph of f .



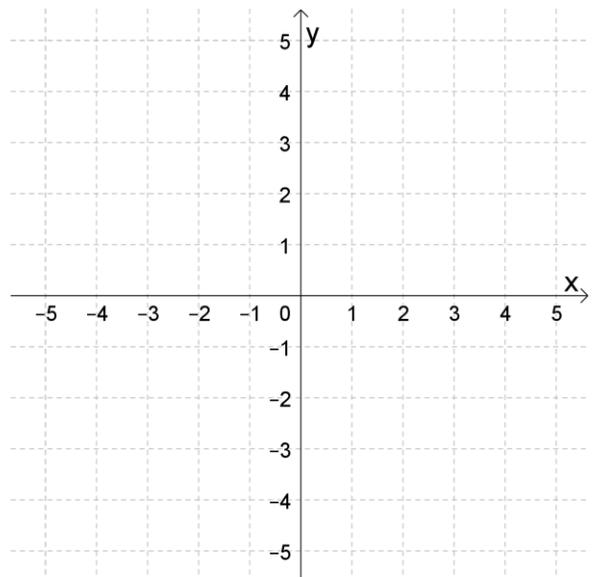
27. Let $f(x) = \frac{x^3 - x^2 + 4x - 4}{x^2 - x - 2}$.

a) Find the domain of f .

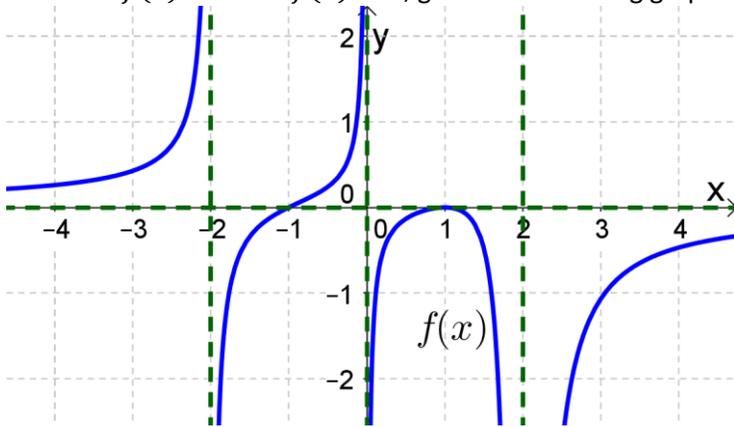
b) Find the x -intercept(s) and y -intercept of f (if any).

c) Find all vertical, horizontal, and slant asymptotes of f . If none, write "none". Also, be sure to show your analysis on each side of each vertical asymptote (if any).

d) Sketch the graph of f .



28. Solve $f(x) > 0$ and $f(x) \leq 0$, given the following graph of f . (NC)



29. Solve $2x^4 < 9x^3 + 5x^2$.

30. Solve $\frac{2x-3}{x+1} \geq 3$.

31. Find the domain of $f(x) = \sqrt{\frac{x-2}{3+2x-x^2}}$. (NC)

32. Fill in the following blanks. (NC)

- a) Even functions are symmetric about the _____.
- b) Odd functions are symmetric about the _____.
- c) The average rate of change of a function is the slope of the _____ line.
- d) The Factor Theorem says that c is a zero of $P(x)$ if and only if _____ is a factor of $P(x)$.
- e) The Remainder Theorem says that if a polynomial $P(x)$ is divided by $x - c$, then the remainder is the value _____.
- f) The Fundamental Theorem of Algebra says that every polynomial with complex coefficients has at least one _____.
- g) The Zeros Theorem says that every degree n polynomial has exactly ___ zeros (counting multiplicity).
- h) The Conjugate Zeros Theorem says that for polynomials with real coefficients, complex zeros come in _____ pairs.