

# Math 18 – Final Exam Info and Review Exercises

Fall 2018, Prof. Beydler

---

## Test Info

---

- Date: Monday, December 3, 2018
- Will cover all worksheets.
- You'll have 1.5 hours to finish the test.
- For this test, you'll need a **scientific calculator**.
- No notes, no books, no phones, no smart watches 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](mailto:dbeydler@mtsac.edu)

## Review Exercises

**Note:** If you write up the answers 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 final exam (depending on neatness and completeness)! It is important to understand that these review exercises are not guaranteed to cover all of the potential problems on the final exam. Please review previous tests, review exercises, and worksheets to fully prepare for the final exam.

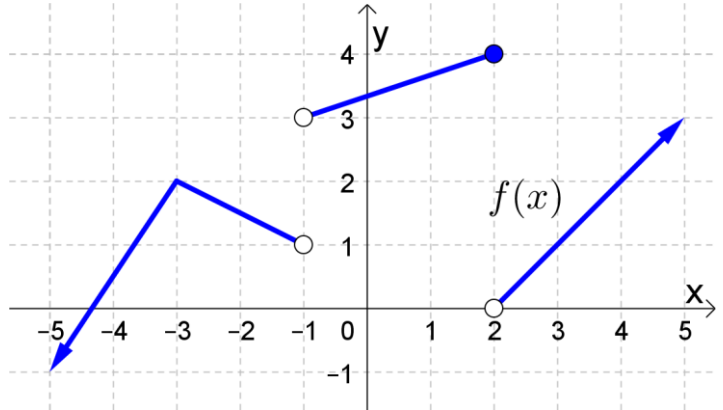
1. Given the graph of  $f(x)$ , find the following.

a)  $f(-3)$

b)  $f(-1)$

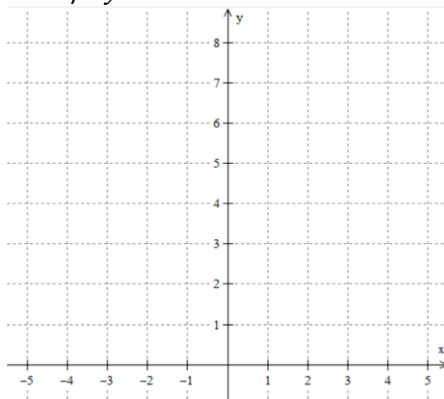
c)  $f(2)$

d)  $f(5)$

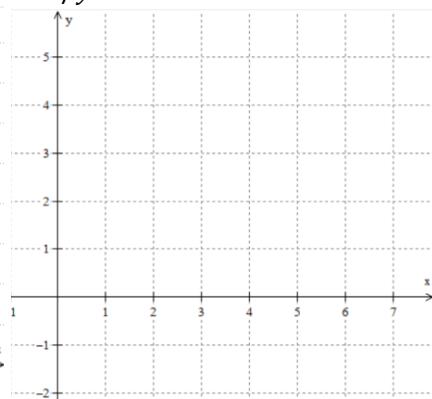


2. Graph the following functions. Label intercepts and asymptotes.

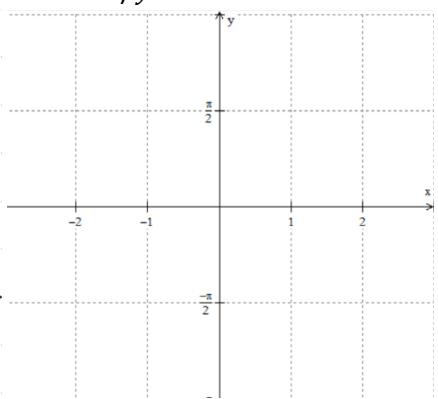
a)  $y = e^x$



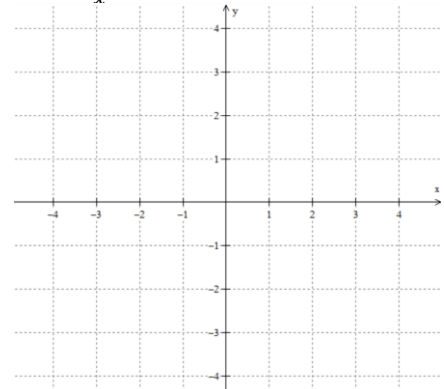
b)  $y = \ln x$



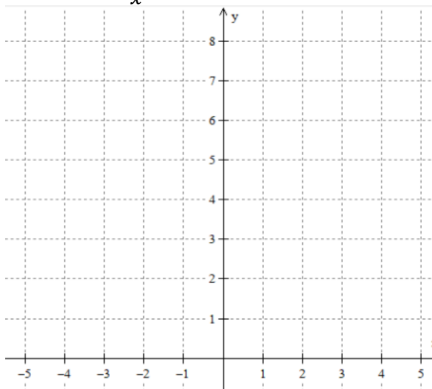
c)  $y = \tan^{-1} x$



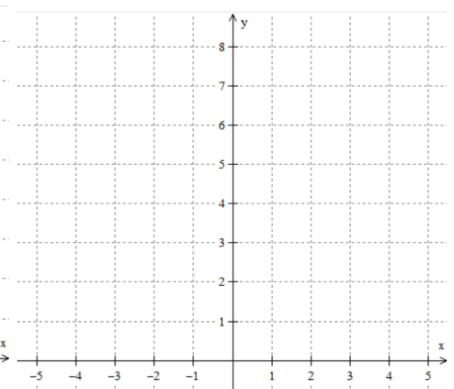
d)  $y = \frac{1}{x}$



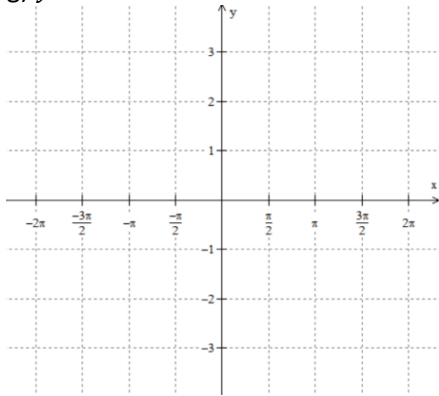
e)  $y = \frac{1}{x^2}$



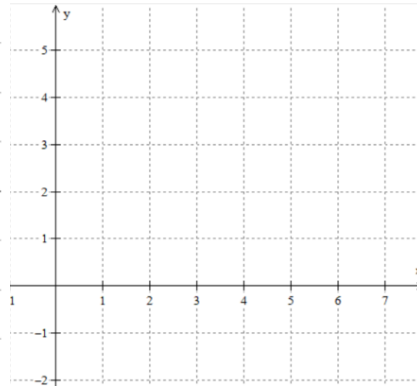
f)  $y = |x|$



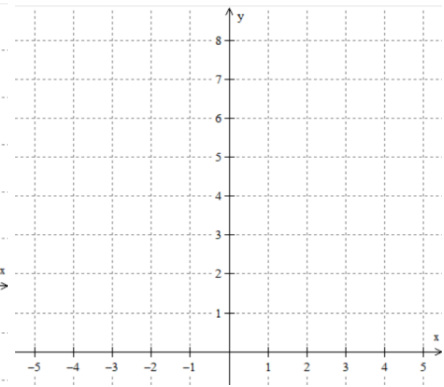
g)  $y = \sin x$



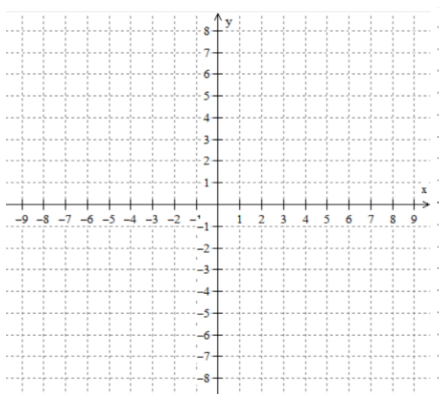
h)  $y = \sqrt{x}$



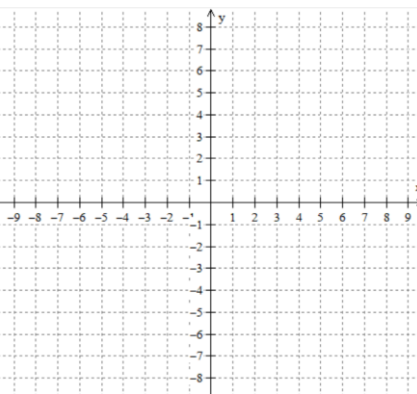
i)  $y = x^2$



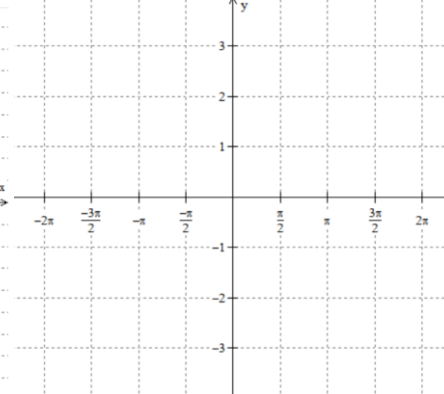
j)  $y = x^3$



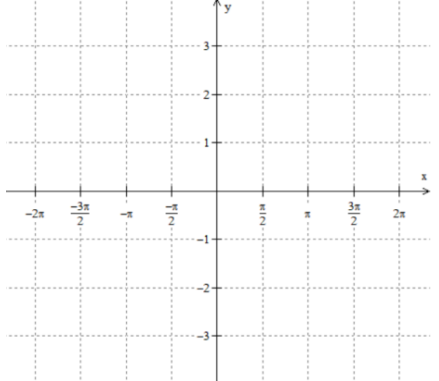
k)  $y = \sqrt[3]{x}$



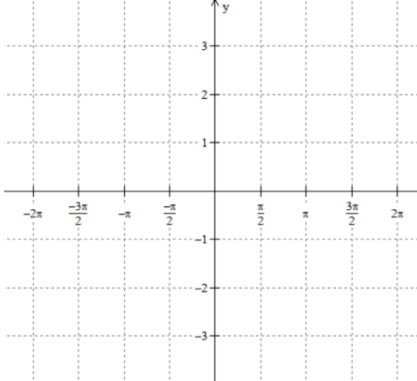
l)  $y = \cos x$



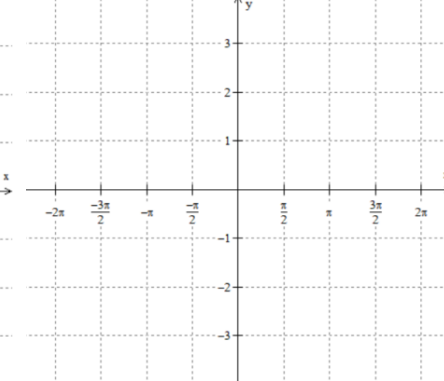
m)  $y = \tan x$



n)  $y = \sec x$

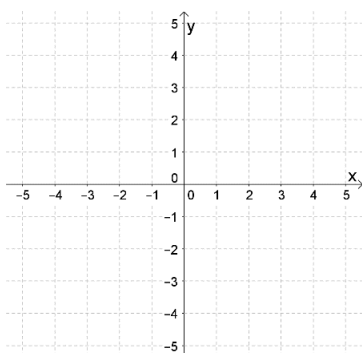


o)  $y = \csc x$

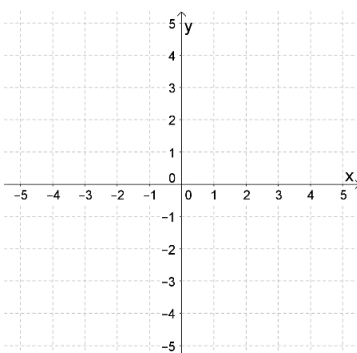


3. Graph each function.

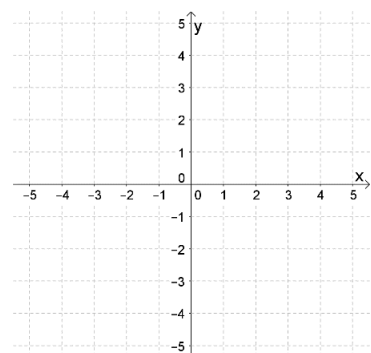
$f(x) = -|x - 2| + 3$



$g(x) = 2\sqrt{x+1}$



$h(x) = 1 + \ln(-x)$



4. Given  $f(x) = \begin{cases} 2^x - 1 & \text{if } x \leq 0 \\ (x - 2)^2 & \text{if } x > 0 \end{cases}$ , find:

a)  $f(-1)$

b)  $f(0)$

c)  $f(-0.001)$

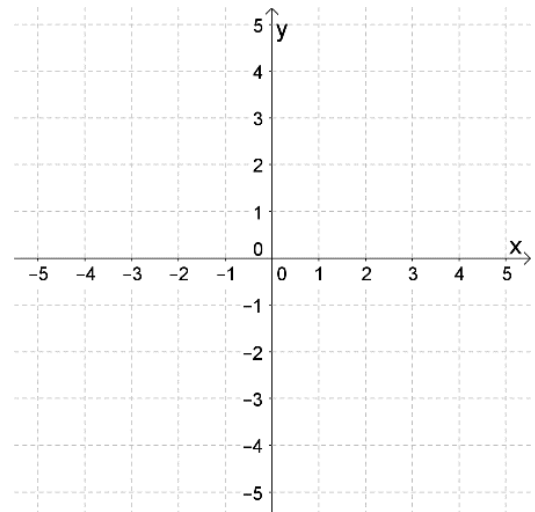
d)  $f(0.001)$

e)  $f(2)$

f) Domain of  $f(x)$

5. Graph the following piecewise function.

$$f(x) = \begin{cases} e^x + 1, & x < 0 \\ 1, & x = 0 \\ 2 - \sqrt{x}, & x > 0 \end{cases}$$



6. Answer the following questions.

a) Rewrite  $\sqrt[4]{x}$  using rational exponents. \_\_\_\_\_

b) Rewrite  $\sqrt{x^5}$  using rational exponents. \_\_\_\_\_

c) Rewrite  $\sqrt[3]{x^4}$  using rational exponents. \_\_\_\_\_

7. Find all solutions to the following equations.

a)  $\sqrt{3} + 2 \cos x = 0$

b)  $\sqrt{2} \sin 3x - 1 = 0$

8. Solve the following equation.  
 $4 + 2 \ln(x + 1) = 12$

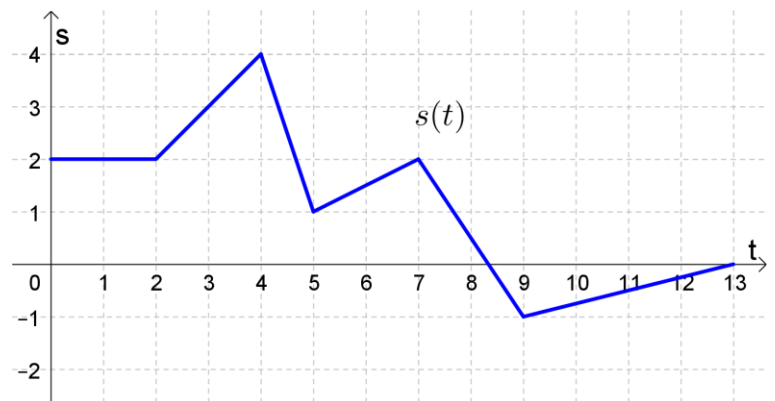
9. Find the equation of the line in **slope-intercept form** through the following points.  
 $(-1, -2)$  and  $(4, 0)$

10. The position of a particle  $s(t)$  (in meters) is shown to the right as a function of  $t$  (in seconds). Find the average velocity of the particle over the following time intervals. Be sure to write the units of your answers.

a)  $t = 7$  to  $t = 9$

b)  $t = 0$  to  $t = 4$

c)  $t = 4$  to  $t = 7$



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

12. Find the difference quotient  $\frac{f(x+h)-f(x)}{h}$  of  $f(x) = \frac{3}{x-1}$  and simplify by canceling the factor of  $h$ .

13. Find the difference quotient  $\frac{f(x+h)-f(x)}{h}$  of  $f(x) = 2\sqrt{x-3}$  and simplify by canceling the factor of  $h$ .

14. Factor the following. You will need to factor out a binomial  $(a + b)^n$ . Be sure to simplify each factor.  
 $6x(3x + 2)^3(x - 1)^2 - 8x^2(3x + 2)^2(x - 1)$

15. Given  $f(x) = \sqrt{3-x}$ ,  $g(x) = e^x$ , and  $h(x) = x^2 - 4$ , evaluate the following:

a)  $(f \circ g)(\ln 2)$

b)  $f(g(h(x)))$

16. Decompose the following functions. Make sure none of your functions are just  $x$ .

a)  $f(g(x)) = \sec|x|$

b)  $f(g(h(x))) = \frac{2}{\sqrt{1-\ln x}}$

$f(x) =$  \_\_\_\_\_

$f(x) =$  \_\_\_\_\_

$g(x) =$  \_\_\_\_\_

$g(x) =$  \_\_\_\_\_

$h(x) =$  \_\_\_\_\_

17. Solve the following equation.

$$\cos x + \sqrt{2} \sin x \cos x = 0$$

18. Determine whether each statement is true or false.

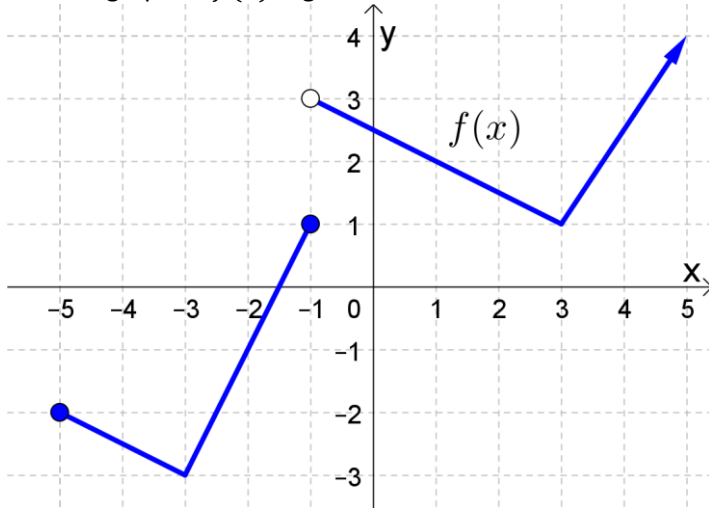
a)  $\log x^4 = 4 \log x$       true    false    (circle one)

b)  $\ln \sqrt{x+y} = \frac{1}{2} \ln x + \frac{1}{2} \ln y$       true    false    (circle one)

c)  $(\ln x)^3 = 3 \ln x$       true    false    (circle one)

d)  $\sqrt{\log x} = \frac{1}{2} \log x$       true    false    (circle one)

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



a) Determine the intervals of  $x$  on which  $f(x)$  is increasing, decreasing, and constant (if any).

Increasing: \_\_\_\_\_

Decreasing: \_\_\_\_\_

Constant: \_\_\_\_\_

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

Local maxima: \_\_\_\_\_

Local minima: \_\_\_\_\_

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

Absolute maxima: \_\_\_\_\_

Absolute minima: \_\_\_\_\_

d) Find the domain of  $f(x)$ .

Domain: \_\_\_\_\_

e) Find the range of  $f(x)$ .

Range: \_\_\_\_\_



20. Solve the following inequality.

$$2x^3 + x^2 - 18x - 9 < 0$$

21. Solve the following inequality.

$$\frac{2x^3 + x^2}{x^2 - 4x + 4} < 0$$

22. Expand the following expression using the properties of logarithms.

$$\ln \left( \frac{(x^2 - 2x - 3)e^{\tan x}}{\sqrt[3]{x+1} \cdot (x^2 + 1)^3} \right)$$

23. Find all  $x$ -values where  $f(x) = 0$  or  $f(x)$  is undefined.

a)  $f(x) = \ln(x^2 - 9)$

b)  $f(x) = e^{2x} - 2xe^{2x} + x^2e^{2x}$

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

d)  $f(x) = 10x^{-2/3} - 5x^{-5/3}$

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

24. Solve the following equations.

a)  $5x^2 - x^2 \ln(x + 1) = 0$

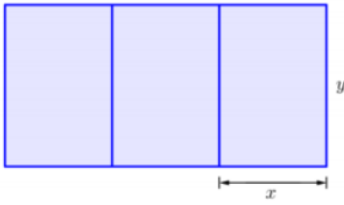
b)  $4 - \frac{2}{x^2} = 0$

25. Simplify the left side of the equation and then solve.

$$\frac{(2x+1)^2(6x) - (3x^2+1) \cdot 2 \cdot (2x+1)}{(2x+1)^4} = 0$$

26. A rectangle is inscribed in a circle of radius 4. Find a function that models the area of the rectangle in terms of its height  $h$ .

27. A 1000-square-foot rectangular plot of land is going to be divided into three equal-sized, adjacent playgrounds (see diagram). Find the number of feet of fencing required as a function of  $x$ . (Note: there is only one fence between the playgrounds, not two.)



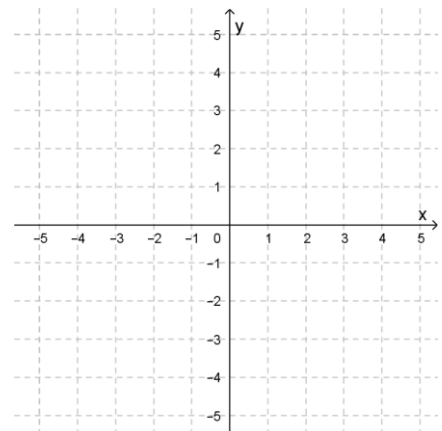
28. Find the first 4 terms and the 100<sup>th</sup> term of  $a_n = \frac{(-1)^n(4n-1)}{(n+1)^2}$ .

29. Evaluate  $\sum_{i=0}^3 \frac{(-1)^{i+1} 2^i}{i+1}$

30. Use the summation formulas to evaluate  $\sum_{i=1}^{12} (i^2 - 3i + 5)$

31. Simplify  $\sum_{i=1}^n \left( \left( \frac{3i}{n} \right)^3 - \left( \frac{3i}{n} \right)^2 \right) \cdot \frac{3}{n}$

32. Graph  $y = |x - 2| + 2$  from  $x = -2$  to  $x = 4$ . Find the area between the curve and the  $x$ -axis.



33. Solve the following inequalities.

a)  $|\sqrt{x-3} - 3| < 2$

b)  $\left| \frac{1}{x} - \frac{3}{2} \right| < 0.01$