

Michigan State University  
Department of Mathematics

**Please Note:** This is a practice exam. The actual exam may differ significantly from this practice exam because there are many varieties of problems that can test each concept.

Page #	Possible Points	Actual Points	Page #	Possible Points	Actual Points
<b>2</b>	<b>24</b>		<b>7</b>	<b>20</b>	
<b>3</b>	<b>22</b>		<b>8</b>	<b>25</b>	
<b>4</b>	<b>18</b>		<b>9</b>	<b>25</b>	
<b>5</b>	<b>18</b>		<b>10</b>	<b>30</b>	
<b>6</b>	<b>18</b>				
<b>Total Exam Points</b>				<b>200</b>	

**INSTRUCTIONS: ALL CELL PHONES MUST BE TURNED OFF AND PUT AWAY. Failure to do so will result in a score of “0” on your exam.**

1. DO NOT OPEN THIS EXAM UNTIL YOU ARE INSTRUCTED TO DO SO.
2. *Without fully opening the exam*, check that you have pages 1-10 and that none is blank.
3. Fill in the information at the top of the page.
4. You will need a pen or pencil, one **approved** calculator and this test booklet for the exam. Please clear everything else from your desk.
5. Calculators are NOT to be shared. Please do not ask your instructor any questions about the use of your calculator.
6. **Please look to the board or overhead for possible corrections to this exam.**
7. Do not spend too much time on a particular problem. Work the easier problems first.
8. Show your work in the space provided. If you need additional space, use the backs of the exam pages. **YOU MUST SHOW ALL OF YOUR WORK!** Points may be withdrawn for answers given without substantiation. (There are problems, however, that will be graded on a right-wrong basis.)
9. Place your answers in the boxes, where provided. **Answers must be simplified** and can be in any form unless specified otherwise. Use standard notation for imaginary number solutions.
10. You will be given **exactly** 120 minutes for this exam.

1. Solve the equation  $A = \frac{B+2}{B-3}$  for  $B$ .

<b>8</b>	
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2. Find the solution set for the equation  $2x - \sqrt{x} - 1 = 0$ .

<b>8</b>	
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3. Solve the inequality  $\left| 5 - \frac{x}{2} \right| \geq 10$ . Write your answer using interval notation.

<b>8</b>	
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<b>24</b>	
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4. Find the equation of the line whose  $x$ -intercept is 8 and  $y$ -intercept is -2. Write the equation in slope-intercept form.

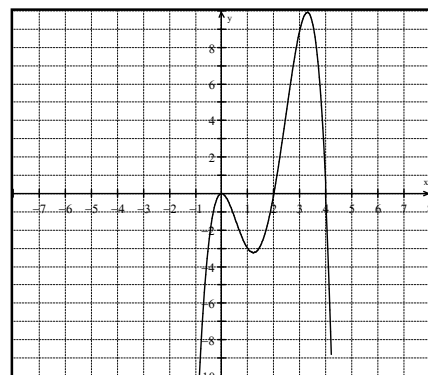
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5. The force on a blade on a wind generator varies jointly with the product of the blade's area and the square of the wind velocity. The force of the wind is 20 pounds when the area is 3 square feet and the velocity is 30 feet per second. Find the force when the area is increased to 5 square feet and the velocity is reduced to 20 feet per second.

<b>8</b>	
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6. Refer to the graph of the polynomial function  $y = f(x)$  below to determine whether each of the statements below is true or false.

- T F** The sign of the leading coefficient is positive.
- T F** The degree of the polynomial is odd.
- T F** This function has a minimum of 3 zeros.
- T F**  $f$  has a relative maximum at  $x = 0$ .



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7. A rectangular field is to be fenced off and divided into three sections as shown below. 800 feet of fencing is to be used.



- (a) Find the dimensions of the field that maximize the total enclosed area.



- (b) What is the maximum area?



**10**

8. A flu outbreak in a small community initially affected 30 residents. After 3 days, 50 residents had the flu. Assuming this increase in the number of flu cases is linear, determine a formula for the number of residents  $r$  affected by the flu after  $d$  days



**8**

**18**

9. Find the domain of  $f$  given  $f(x) = \frac{\sqrt{x}}{x^2 - 25}$  using interval notation.

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<b>6</b>	
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10. If  $f(x) = \log_5(x + 8) - 3$ , find the  $x$ -intercept of the graph of  $f$ .

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<b>6</b>	
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11. Find the inverse equation,  $f^{-1}(x)$ , of the function  $f(x) = \log_3(x - 5) + 3$ .

$f^{-1}(x) =$
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<b>6</b>	
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<b>18</b>	
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12. Solve  $\log(x + 3) + \log(x - 2) = \log 14$ .

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13. The federal minimum wage was \$3.10 in 1980. It was \$7.25 in 2009.

(a) Find an exponential growth model,  $A = A_0e^{kt}$ , in which  $t$  is the number of years after 1980. Round the  $k$  value in your model to 6 decimal places.

$A =$
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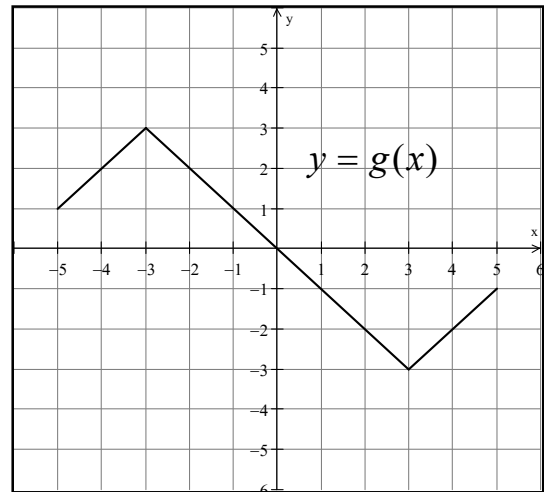
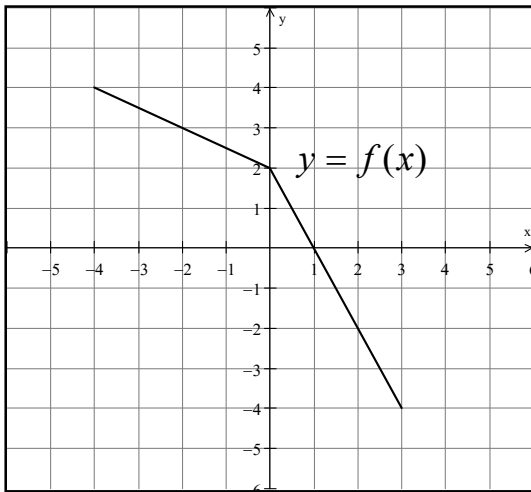
(b) Based on your model, estimate the minimum wage in 2012.

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14. Refer to the graphs of  $f$  and  $g$  below to answer questions (a) – (j). Use **interval notation** where applicable.



(a) Find  $f(-2) - g(2)$

(f) On which interval(s) is  $g$  decreasing?

(b) Evaluate  $f^{-1}(-2)$ .

(g) State the domain of  $\frac{g}{f}$ .

(c) Evaluate  $\frac{f}{g}(3)$ .

(h) Find the slope of the steepest line segment on the graph of  $f$ .

(d) Evaluate  $(g \circ f)(-4)$ .

(i) Which function is a one-to-one function?

(e) State the range of  $f$ .

(j) Is  $g$  even, odd or neither?

Problems 15 – 30 are **MULTIPLE CHOICE** problems. Each problem is worth 5 points.  
**Circle one answer for each question.**

15. Find the solution set:  $\frac{1}{x+7} + \frac{3}{x+4} = \frac{-3}{x^2 + 11x + 28}$ .

- (a)  $\{-4, -7\}$       (b)  $\{-4\}$       (c)  $\{-7\}$       (d)  $\{7\}$       (e)  $\phi$
- 

16. Which of the following are solutions of  $3x^2 + x = 10$ ?

- (a)  $-2, \frac{3}{5}$       (b)  $2, \frac{3}{5}$       (c)  $-2, \frac{5}{3}$       (d)  $2, \frac{5}{3}$       (e) none of these
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17. Including a 6% sales tax, an item cost \$265. What is the cost of the item before the tax was added?

- (a) \$280.90      (b) \$249.10      (c) \$284.10      (d) \$250      (e) none of these
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18. Which of the following ordered pairs satisfies the equation  $3y - 2x = -4$ ?

- (a) (5, 2)      (b) (5, -2)      (c) (-5, 2)      (d) (-5, -2)      (e) none of these
- 

19. If  $f(x) = \frac{2}{x-3}$  and  $g(x) = \frac{1}{x}$ , then  $(f \circ g)(x)$  is equal to

- (a)  $\frac{2x}{1-3x}$       (b)  $\frac{2}{x-3}$       (c)  $\frac{2x}{x-3}$       (d)  $\frac{1-3x}{2-x}$       (e) none of these
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20. If  $(5, 2)$  is a point on the graph of  $y = f(x)$ , what are the coordinates of the corresponding point on the graph of  $y = 2f(-x - 3)$ ?

- (a)  $(2, -4)$    (b)  $(-2, 4)$    (c)  $(8, -4)$    (d)  $(-8, 4)$    (e) none of these
- 

21. The slope of all lines perpendicular to the line  $2x - 3y - 7 = 0$  is

- (a)  $\frac{2}{3}$    (b)  $-\frac{2}{3}$    (c)  $\frac{3}{2}$    (d)  $-\frac{3}{2}$    (e) none of these
- 

22. Which of the following is a one-to-one function?

- (a)  $y = x^2$    (b)  $y = 2x + 1$    (c)  $x^2 + y^2 = 4$    (d)  $x = 2$    (e) none of these
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23. Find the horizontal asymptote(s) of  $g$ , given  $g(x) = \frac{2x^2}{x^2 - 7x + 6}$ .

- (a)  $y = 0$    (b)  $y = 6$  and  $y = 1$    (c)  $y = 2$    (d)  $x = 2$   
(e)  $g$  has no horizontal asymptotes
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24. The solution for the rational inequality  $\frac{x + 4}{x - 8} \leq 0$  is

- (a)  $[-4, 8)$    (b)  $(-4, 8)$    (c)  $[-4, 8]$    (d)  $(-4, 8]$    (e) none of these
-

25. Which of the following equations is equivalent to the equation  $y = 8(2)^x$  ?

- (a)  $y = 8x \ln 2$    (b)  $y = 8e^{\ln(2x)}$    (c)  $y = 8e^{2 \ln x}$    (d)  $y = 8e^{(\ln 2)x}$   
(e) none of these
- 

26.  $e^{5 \ln xy - 2 \ln y + \ln 2}$  is equal to

- (a)  $\frac{x^5 y^3}{2}$    (b)  $2xy^3$    (c)  $2x^5 y^3$    (d)  $\frac{x^3 y^3}{2}$    (e) none of these
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27. \$2400 is invested for 5 years in an account that earns 8.5% annual interest compounded quarterly. The accumulated value (to the nearest cent) is

- (a) \$3520.00   (b) \$3608.76   (c) \$3671.00   (d) \$3654.71   (e) none of these
- 

28. How long (to the nearest tenth of a year) will it take an investment to double if compounded continuously with an interest rate of 4.3%?

- (a) 1.6 years   (b) 7.0 years   (c) 16.1 years   (d) 46.5 years   (e) none of these
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29. The asymptote of the graph of  $h(x) = 2^{x-5} + 3$  is

- (a)  $x = 3$    (b)  $x = -3$    (c)  $y = -3$    (d)  $y = 3$    (e) none of these
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30. Which of the following is the best estimate of  $\log_5(\ln \pi)$  ?

- (a) .084   (b) .289   (c) .800   (d) .758   (e) .998
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