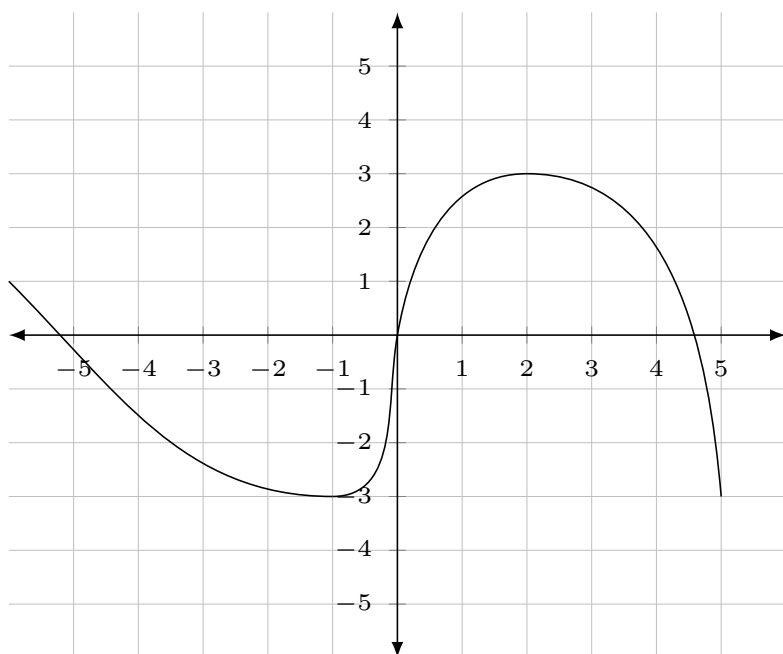


Math-8 Final Exam

Name: _____

This exam is closed book and notes, except for a two-sided $3 \times 5''$ index card of notes. You may also use a graphing calculator; however, no other electronics are allowed. Show all work in an organized fashion; there is no credit for guessed answers or work that I cannot follow or doesn't appear to lead to your answers. All answers should be in exact values unless you are specifically asked for an approximate value.

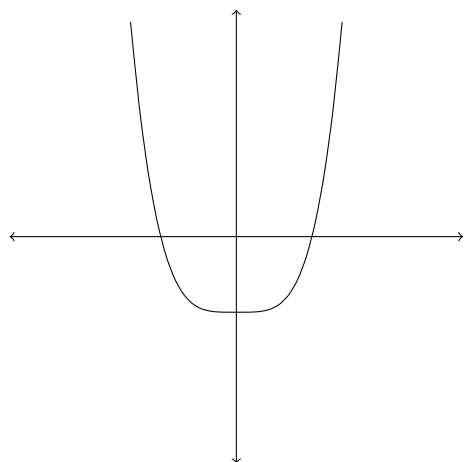
- 1). Consider the following graph of the function $y = f(x)$:



Assume that $f(x) \rightarrow \infty$ as $x \rightarrow -\infty$ and $f(x) \rightarrow -\infty$ as $x \rightarrow \infty$.

- Where is the function increasing (in interval notation)?
- Where is the function decreasing (in interval notation)?

2). Circle the polynomial function that best matches the following graph:



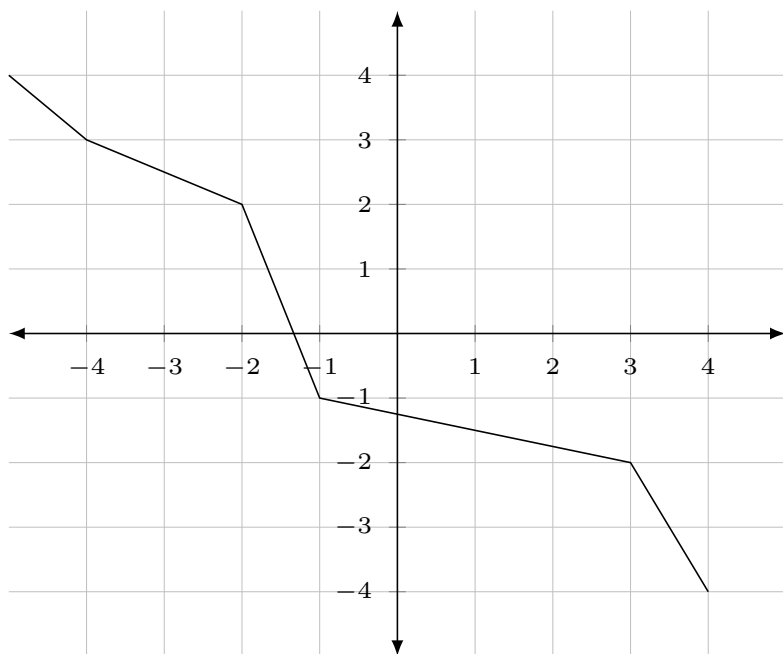
$$f(x) = (x - 1)^4 \quad f(x) = (x + 1)^4 \quad f(x) = x^4 + 1 \quad f(x) = x^4 - 1$$

$$f(x) = (x - 1)^5 \quad f(x) = (x + 1)^5 \quad f(x) = x^5 + 1 \quad f(x) = x^5 - 1$$

3). Evaluate the following expression without using a calculator:

$$\log_2(8) =$$

4). Consider the following graph of the function $y = f(x)$:



Find the following value:

$$f^{-1}(3) =$$

5). Solve for x . Your answer must be in interval notation.

$$|2x - 1| + 3 \leq 6$$

6). Let $f(x) = \sqrt[3]{x+5}$ and $g(x) = x^2 - 4$. Determine the following composite function (you do not need to simplify):

$$(f \circ g)(x) =$$

7). Solve for x using the quadratic formula. Be sure to leave your answer in exact form:

$$5x = 13 - 3x^2$$

- 8). Divide $x^3 - 5x^2 + 2x - 7$ by $x^2 + 3x - 4$. Write your final answer in division algorithm form.

9). Consider the following equation of a circle:

$$x^2 - 4x + y^2 - 9x + 1 = 0$$

a). Convert the general form to standard form.

b). What are the coordinates of the center and the length of the radius?

10). Compute and simplify completely the difference quotient for $f(x) = 3x - x^2$.

11). Consider the relation $y^2 + 3xy - 2x = 36$.

a). Determine all x -intercepts (if any). Remember to state as points.

b). Determine all y -intercepts (if any). Remember to state as points.

12). Determine the equation of the line that is perpendicular and through the midpoint of the line connecting the points $(-2, 5)$ and $(7, 1)$. Your answer must be in slope-intercept form.

- 13). Katya deposits \$1000 in an interest-bearing account. The amount of money in her account after t years is given by:

$$A = 1000e^{0.05t}$$

- a). What is the compounding period?

- b). What is the interest rate (with units)?

- c). What is the account balance after 2 years?

- d). How long does it take for the account balance to reach \$2500? Round your answer to one decimal point and don't forget to state the units.

14). Solve for x :

$$x - \frac{10}{x+1} = 2$$

15). Consider the parabolic function:

$$f(x) = x^2 - 6x - 5$$

a). Convert the general form to standard form.

b). What are the coordinates of the vertex?

c). What are the x -intercepts (if any)?

d). What are the y -intercepts (if any)?

e). Sketch the graph. You must label the vertex and all intercepts.

f). State the domain and range in interval notation.

16). Consider the following expression:

$$\ln \frac{x^3}{13\sqrt{y}}$$

Expand completely using the properties of logs.

17). Let $f(x) = 5x - 7$

a). Find $g(x) = f^{-1}(x)$

b). Prove that f and g are inverses.

18). Find the domain (in interval notation) of the function $f(x) = \sqrt{x^2 - 4x - 5}$.

19). Consider the following function:

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

a). List the standard function and the transformations in the order that they are applied.

i.

ii.

iii.

iv.

b). Determine the x -intercepts (if any).

c). Determine the y -intercepts (if any).

d). Sketch the graph. You must label all important points.

20). Consider the following polynomial function:

$$f(x) = x^3 - 4x^2 + x + 6$$

- a). Factor completely. For full credit you must show how you determine the candidate zeros, how you selected the actual zeros, and how you use long (or synthetic) division.

b). Sketch the graph. For full credit you must label all intercepts and state how you determined the behavior at each zero using either a sign table or multiplicity.

c). Using your calculator, determine all minima and maxima (there should be two).