

Math-1003b Final Exam

Name: _____

This exam is closed book and notes. You may use a scientific calculator; however, no other electronics are allowed. Calculators may not be shared. Show all work; there is no credit for guessed answers. All answers must be in simplified form with no negative exponents. Decimal answers are only acceptable where requested; otherwise, presence of a decimal value will result in no credit for the entire problem.

1). Simplify the following expression:

$$\left(\frac{x-2}{x^2-3x-18} \right) \left(\frac{3x-18}{x^2-4} \right)$$

2). Simplify the following expression:

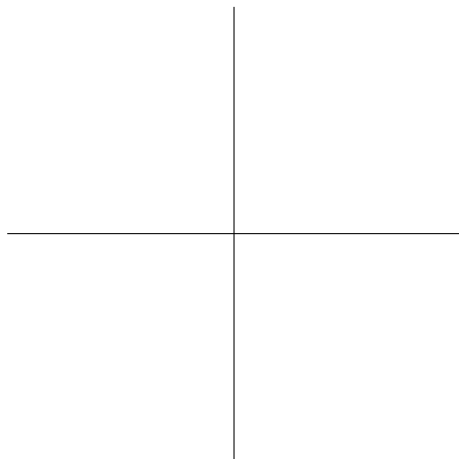
$$\frac{4}{3m} - \frac{1}{m+2}$$

3). A runner competes in a 2 mile race. He runs the first mile 1 mph faster than the second mile and finishes the first mile 3 minutes ($\frac{1}{20}$ of an hour) faster than the second mile. How fast (in mph) did he run the first mile? For full credit you must show the original equation in one variable (t) as a difference of rational functions ($t_2 - t_1 = \Delta t$) and then solve the equation.

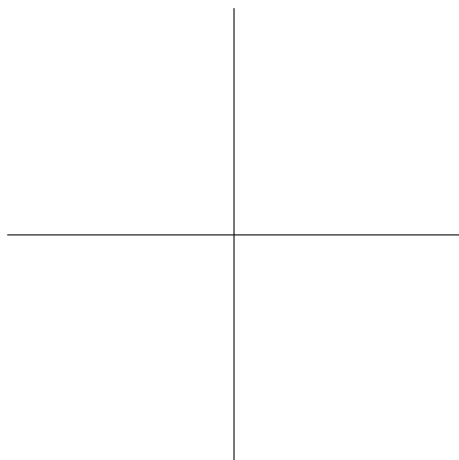
4). Let $f(x) = x^{-\frac{2}{3}} + |x| - 3$. Evaluate the function at $x = -8$.

5). Sketch (do not plot points) for the following functions:

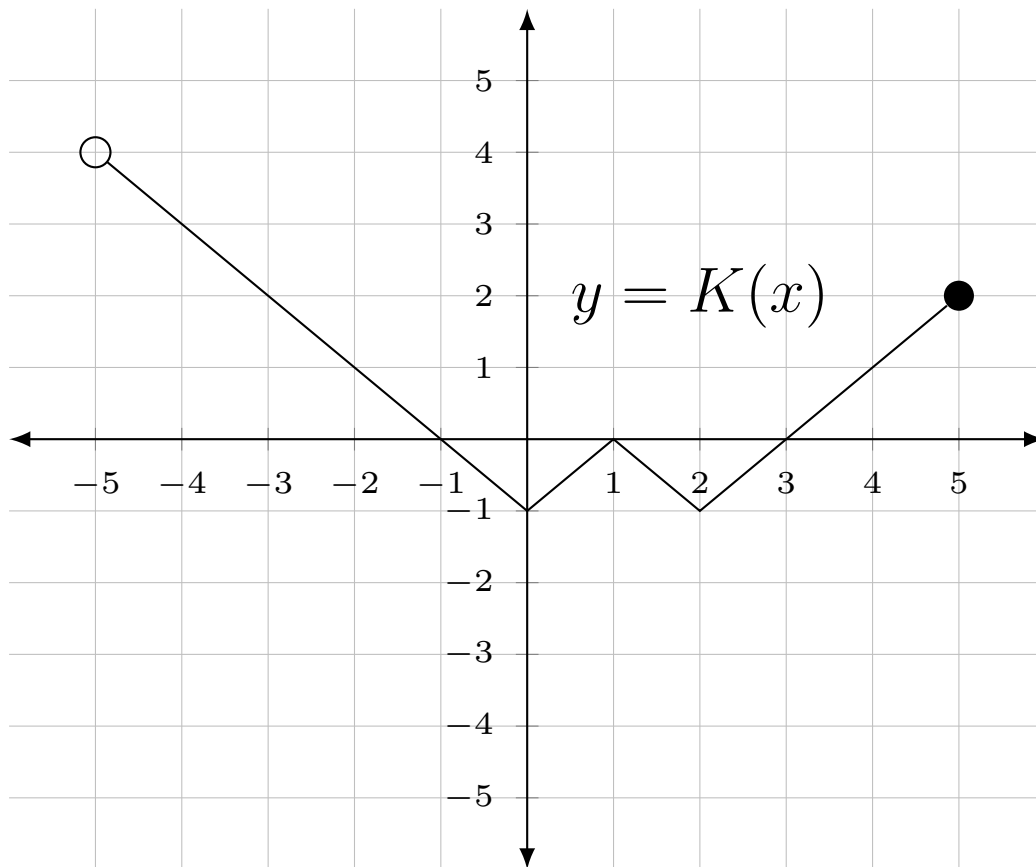
a). $f(x) = |x|$.



b). $f(x) = x^3$.



6). Use the graph of $K(x)$ to answer the following questions:



- What is $K(2)$?
- What is the y-intercept?
- For what values of x is $K(x) = 0$?
- What is the domain of K , in interval notation?
- What is the range of K , in interval notation?

7). Let $f(x) = x - 4$ and $g(x) = x^2 + 2$. Perform the following operations:

a). $f + g$

b). fg

c). $\frac{f}{g}$

d). $f \circ g$

e). $g \circ f$

- 8). The area of a picture projected on a wall varies directly as the square of the distance from the projector to the wall. If a 10 foot distance produces a picture with an area of 16 squarefeet, then what is the area of a picture produced with the projection unit is moved to a distance 20 feet from the wall?

- 9). Solve the following inequalities. Your answers must be in interval notation:

a). $-6 < 5x + 1 \leq 6$

b). $5x + 1 \leq -6$ or $5x + 1 > 6$

10). Solve the following inequalities. Your answers must be in interval notation:

a). $x^2 - 3x - 10 > 0$

b). $\frac{x-5}{x+2} \leq 0$

11). Solve for x :

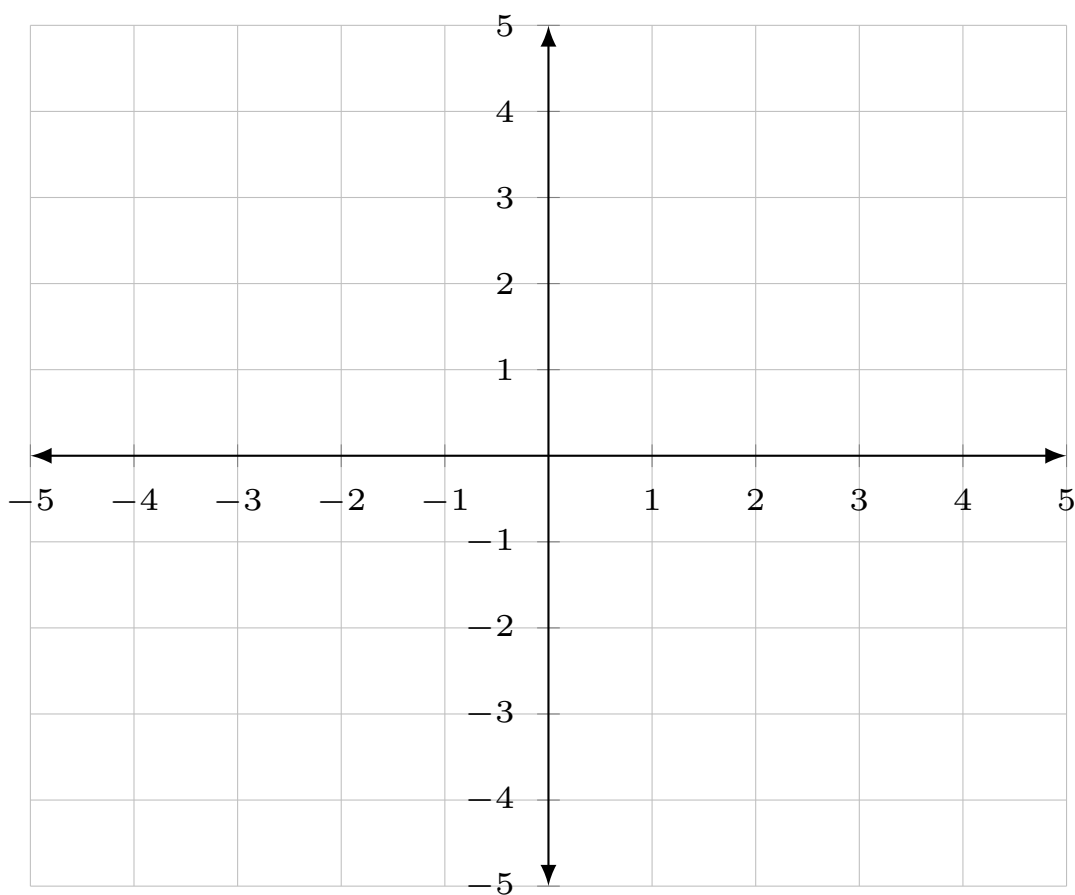
a). $\left| \frac{1}{2}x + 3 \right| - 4 = 4$

b). $\left| \frac{1}{2}x + 3 \right| - 4 < 4$

c). $\left| \frac{1}{2}x + 3 \right| - 4 \geq 4$

- 12). Solve the following system of inequalities graphically. For full credit, determine and label the x and y intercepts for each line, sketch the two lines using the intercepts, and then select the correct region.

$$\begin{cases} x - y < 2 \\ 3x - 2y \geq 6 \end{cases}$$



13). Simplify (assume all variables are nonnegative):

$$\left(\frac{16x^{-2}y}{2xy^{-8}}\right)^{\frac{1}{3}}$$

14). Evaluate each of the following. If not possible, say “not a real number”:

a). $16^{\frac{5}{4}}$

b). $-16^{\frac{5}{4}}$

c). $(-16)^{\frac{5}{4}}$

d). $-16^{-\frac{5}{4}}$

e). $\sqrt[4]{16^5}$

15). Simplify:

$$5a\sqrt{48a^3} - \sqrt{27a^5}$$

16). Rationalize the denominators of the following:

a).

$$\frac{xy}{\sqrt[3]{x^2y^4}}$$

b).

$$\frac{2}{\sqrt{x} - 2}$$

17). Solve the following for x :

$$\sqrt{2x + 7} - 2 = x$$

For problems 18 – 20, consider the following general form of a parabola:

$$y = 2x^2 + 5x - 7$$

18). Find the x intercepts by completing the square.

19). Find the x intercepts by using the quadratic formula.

20). Convert to standard form by completing the square, note the x -intercepts found above, determine the y -intercept, and then sketch the graph. The intercepts and vertex **MUST** be labeled on your sketch for full credit!