Name: ______________________________

The real first exam will not have this many questions! These are here for additional practice.

You may *not* use a calculator for the first part of this exam. You may *not* use notes or the text book at any point. Scratch paper and a straight-edge might be useful, and you may use these.

Read each problem carefully, and follow all the instructions.

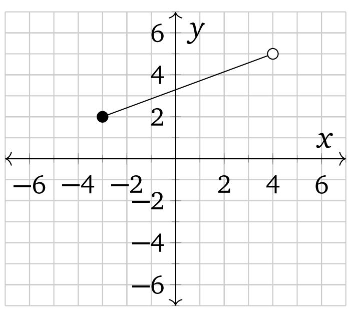
Show all of your work. When possible, check your answers. If appropriate, write a conclusion statement.

No Calculator Portion

You may *not* use a calculator with capabilities beyond basic arithmetic for this part of this exam.

1. The real first exam will not have this many questions! These are here for additional practice.
2. Several of the following questions from the first exam are likely to appear on the second exam: 1f, 2, 3, 4a, 4c, 4d, 5b, 6b, 7b, 9c, 9d, 10. They will not be the exact same versions, but they will be the same essential math exercise.
3. Each graph is the graph of $y = f(x)$ for some function f. What is the domain and range of each function f?

a)



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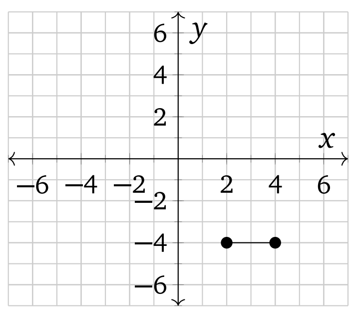

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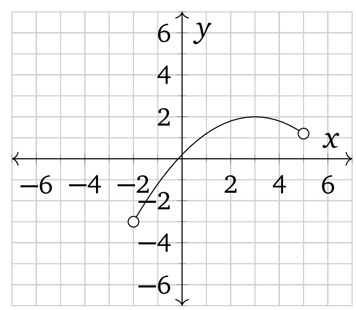

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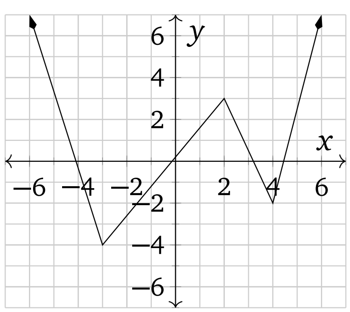

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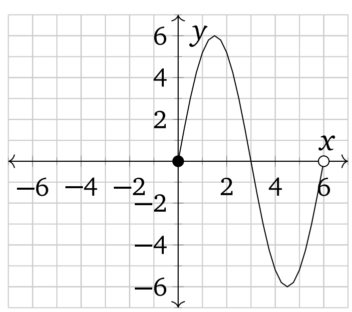

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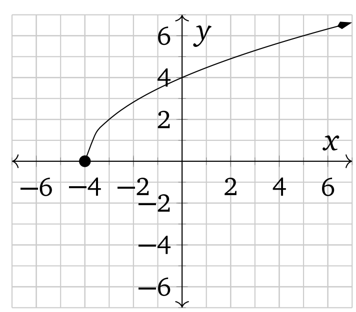


4. Find the domain of each function using its formula.

a) $F(x) = -8x + 4$

b) $K(x) = \dfrac{3x}{x-6}$

c) $H(x) = \dfrac{4x+1}{x^2+3x+2}$

d) $f(x) = \dfrac{9x+4}{x^2+5x}$

e) $g(x) = \dfrac{10-9x}{64x^2-9}$

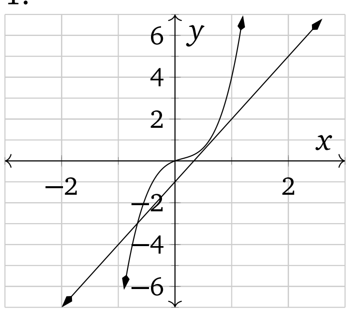
f) $h(x) = \dfrac{9}{\sqrt{x+9}}$

g) $k(x) = \sqrt{4-x}$

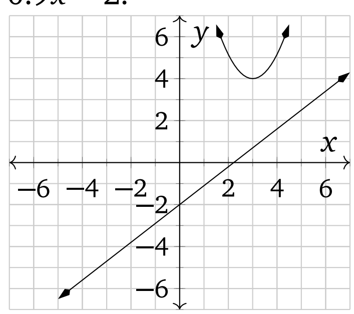
h) $p(x) = \sqrt{4+19x}$

5. Use the graphs to solve the equation. Your solution(s) may be approximated from reading the graph.

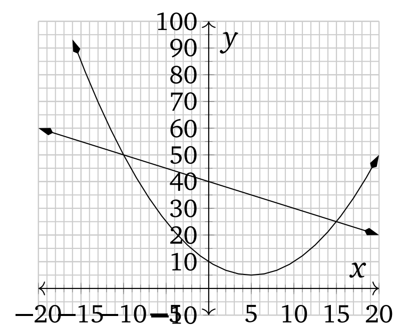
a) Graphs of
$y = 5x^3 - 2x^2 + x$
$y = 3x - 1$
Solve $5x^3 - 2x^2 + x = 3x - 1$.



b) Graphs of
$y = 1.15(x-3)^2 + 4$
$y = 0.9x - 2$
Solve $1.15(x-3)^2 + 4 = 0.9x - 2$.

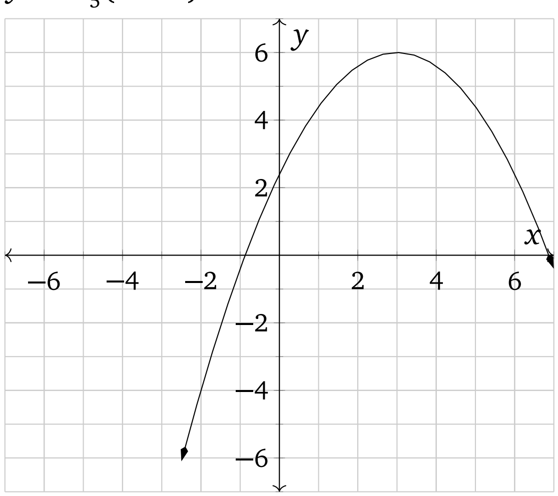


c) Graphs of
$y = \frac{1}{5}x^2 - 2x + 10$
$y = -x + 40$
Solve $\frac{1}{5}x^2 - 2x + 10 = -x + 40$.

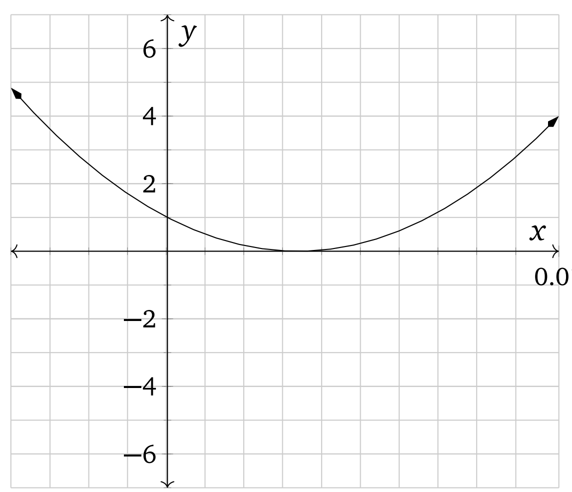


6. For each function j, use its graph below to find all of its intercepts and any high/low points. Your answers may be approximated from reading the graph.

a) $y = -\frac{2}{5}(x-3)^2 + 6$



b) $y = (300x - 1)^2$



7. Simplify each expression.

a) $f(t+3)$, where $f(t) = 1 + 5t$

b) $F(-x)$, where $F(x) = -4 + 7x$

c) $g(r) + 3$, where $g(r) = -8r + 4$

d) $K(9y)$, where $K(y) = -7y^2 - 7y - 5$

e) $g(-r)$, where $g(r) = -7r^2 + 6r + 1$

f) $4h(t)$, where $h(t) = -2t^2 - 4t - 2$

g) $k(x+4)$, where $k(x) = \sqrt{1 - 5x}$

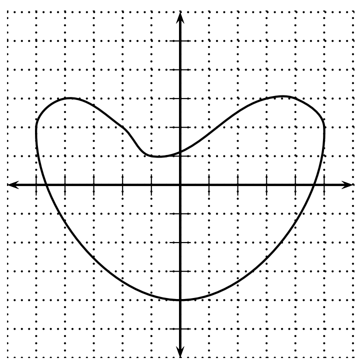
h) $p(x+8)$, where $p(x) = -8x + \sqrt{-1 + 5x}$

i) $q(y+4)$, where $q(x) = -\dfrac{1}{7y - 1}$

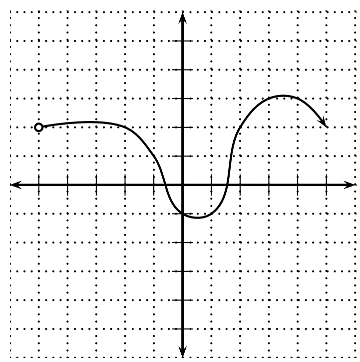
j) $H(4s)$, where $H(s) = \dfrac{4s}{3s^2 - 1}$

8. Circle each of the following graphs where y is a function of x. Do not circle the graphs where y is not a function of x.

a)



b)



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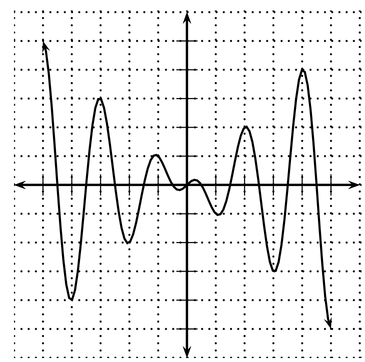

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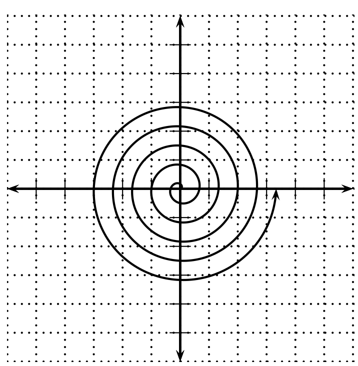

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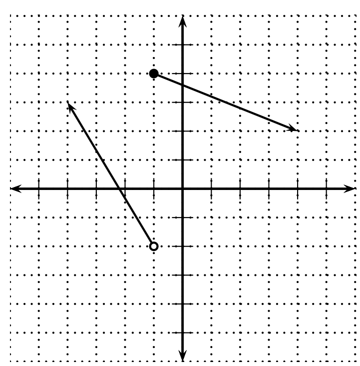

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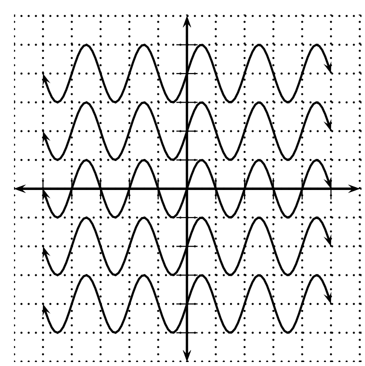

9. Solve each of the following equations.

a) $\dfrac{z}{z+8} = 10$

b) $-\dfrac{3}{10r + 17} = r$

c) $\dfrac{-4r - 9}{r + 8} = \dfrac{2r + 4}{r + 8}$

d) $\dfrac{4}{y - 9} + 6 = \dfrac{2}{y - 9}$

e) $\dfrac{20}{y^2 - 25} + \dfrac{2}{y + 5} = \dfrac{y}{5 - y}$

10. Simplify each of the following expressions.

a) $\dfrac{2x-4}{x^2+3x-10}$

b) $\dfrac{x^3-3x^2+3x-9}{x-3}$

c) $(x-4)\dfrac{x^2-6x+5}{x^2+x-20}$

d) $\dfrac{x^2+4x}{x^2} \div \dfrac{x^2-16}{x^2-2x}$

e) $\dfrac{\frac{8a+10}{a}}{\frac{a+7}{a}}$

f) $\dfrac{8+\frac{1}{s}}{s+3}$

g) $\dfrac{\frac{1}{c+2}+\frac{5}{c-2}}{5-\frac{1}{c-2}}$

11. Perform the indicated operations and leave a single simplified rational expression.

a) $\dfrac{4}{5x^2}+\dfrac{5}{x}$

b) $4+\dfrac{4}{4x+3}$

c) $\dfrac{x+2}{x+3}-\dfrac{x+5}{x+1}$

d) $\dfrac{x^2-30}{x^2+10x+24}-\dfrac{x+3}{x+6}$

Calculator Portion

For these exercises you may use a calculator. The expectation is that you probably should use a calculator. But you still should follow the directions.

12. It takes one contractor 24 hr longer to install drywall in a new building than it does a more experienced contractor. Together they can install all the drywall in 35 hr. How long does it take for each contractor to install the drywall working alone?

13. Assume a car uses gas at a constant rate. After driving 20 miles since a full tank of gas was purchased, there was 11.2 gallons of gas left; after driving 60 miles since a full tank of gas was purchased, there was 9.6 gallons of gas left. Let $f(x)$ represent the amount of gas left int he tank (measured in gallons) after driving x miles after the fill-up. Find this function's domain and range in this context.

14. Assume a tree grows at a constant rate. When the tree was planted, it was 2.8 feet tall. After 10 years, the tree grew to 9.8 feet tall. This type of tree will live to be 150 years old, and then stop growing. Let $h(t)$ be the height of the tree (in feet) t years since it was planted. Find this functions domain and range.

15. Make a table for the function K, where $K(x) = -2.3x^2 - 190x - 91$.

Answers

1. OK.

2. OK.

3. a) Domain is $[-3,4)$. Range is $[2,5)$.
   b) Domain is $[2,4]$. Range is $\{-4\}$.
   c) Domain is $(-2,5)$. Range is $(-3,2]$.
   d) Domain is $(-\infty,\infty)$. Range is $[-4,\infty)$.
   e) Domain is $[0,6)$. Range is $[-6,6]$.
   f) Domain is $[-4,\infty)$. Range is $[0,\infty)$.

4.

a) The domain is $(-\infty, \infty)$.

b) The domain is $(-\infty, 6) \cup (6, \infty)$.

c) The domain is $(-\infty, -2) \cup (-2, -1) \cup (-1, \infty)$.

d) The domain is $(-\infty, -5) \cup (-5, 0) \cup (0, \infty)$.

e) The domain is $\left(-\infty, -\frac{3}{8}\right) \cup \left(-\frac{3}{8}, \frac{3}{8}\right) \cup \left(\frac{3}{8}, \infty\right)$.

f) The domain is $(-9, \infty)$.

g) The domain is $(-\infty, 4]$.

h) The domain is $\left[-\frac{4}{19}, \infty\right)$.

5.

a) The solution set is roughly $\{-0.7\}$.

b) The solution set is empty. (There is no solution.)

c) The solution set is $\{-10, 15\}$.

6.

a) Roughly $(-0.9, 0)$, $(6.9, 0)$, $(0, 2.4)$, and $(3, 6)$.

b) Roughly $(0.0035, 0)$ and $(0, 1)$.

7.

a) $5t + 16$

b) $-7x - 4$

c) $-8r + 7$

d) $-567y^2 - 63y - 5$

e) $-7r^2 - 6r + 1$

f) $-8t^2 - 16t - 8$

g) $\sqrt{-5x - 19}$

h) $-8x + 64 + \sqrt{5x + 39}$

i) $-\frac{1}{7y+27}$

j) $\frac{16s}{48s^2-1}$

8.

a) y is not a function of x.

b) y is a function of x.

c) y is a function of x.

d) y is not a function of x.

e) y is a function of x.

f) y is not a function of x.

9.

a) The solution set is $\left\{-\frac{80}{9}\right\}$.

b) The solution set is $\left\{-\frac{3}{2}, -\frac{1}{5}\right\}$.

c) The solution set is $\left\{-\frac{13}{6}\right\}$.

d) The solution set is $\left\{\frac{26}{3}\right\}$.

e) The solution set is $\{-5, -2\}$.

10.

a) $\dfrac{2}{x+5}, x \neq 2$

b) $x^2 + 3, x \neq 3$

c) $\dfrac{(x-5)(x-1)}{x+5}, x \neq 4$

d) $\dfrac{x-2}{x-4}, x \neq 0, -4$

e) $\dfrac{2(4a+5)}{a+7}, a \neq 0$

f) $\dfrac{8s+1}{s(s+3)}$

g) $\dfrac{2(3c+4)}{(c+2)(5c-11)}, c \neq 2$

11.

a) $\dfrac{25x+4}{5x^2}$

b) $\dfrac{16(x+1)}{4x+3}$

c) $\dfrac{-(5x+13)}{(x+3)(x+1)}$

d) $\dfrac{-7}{x+4}, x \neq -6$

12. Let t be the time it takes the faster contractor to do the work, measured in hours. Then $t+24$ is the time it takes the other employee. The faster one can do it at a rate of $\frac{1\text{ building}}{t\text{ hours}}$. The slower one can do it at a rate of $\frac{1\text{ building}}{(t+24)\text{ hours}}$. So working together, they have a rate of $\frac{1}{t}+\frac{1}{t+24}$ buildings per hour. But from the problem, we know their combined rate is $\frac{1\text{ building}}{35\text{ hours}}$. So

$$\frac{1}{t}+\frac{1}{t+24}=\frac{1}{35}$$

Solving this equation, the solution set is $\{-14, 60\}$. Only the positive solution makes sense in context. So it takes the faster contractor 60 hours and the slower employee 84 hours.

13. We have been told that $f(20) = 11.2$ and $f(60) = 9.6$. And also we are told that f is a linear function. So find its slope: -0.04 gallons per mile. And so f has formula $f(x) = -0.04(x-20)+11.2$. Note that $f(0) = 19.2$, so the car starts with 19.2 gallons of gas. It drives until the gas is used up: 0 gallons. So the range of this function is $[0, 19.2]$. For the domain, we need to know when it runs out of gas, so solve $-0.04(x-20)+11.2 = 0$. The solution is $x = 300$. So the domain is $[0, 300]$.

14. We have been told that $h(0) = 2.8$ and $h(10) = 9.8$. And also we are told that f is a linear function. So find its slope: 0.7 feet per year. And so h has formula $h(t) = 0.7t + 2.8$. Note that $h(0) = 2.8$, so the tree starts out 2.8 feet high. And note $h(150) = 107.8$, so its maximum height is 107.8 feet. So the range of this function is $[2.8, 107.8]$. The domain is $[150]$.

15.

x	$K(x)$
-5	801.5
-4	632.2
-3	458.3
-2	279.8
-1	96.7
0	-91
1	-283.3
2	-480.2
3	-681.7
4	-887.8
5	-1099