

Solve each system.

1) $y = \frac{1}{2}x - 9$

$y = -\frac{13}{8}x + 8$

- A) Infinite number of solutions
B) $(-8, -3)$
C) $(-8, -5)$
D) $(8, -5)$

3) $5x - 3y = 3$
 $x - 3y = -9$

- A) $(3, 4)$ B) $(2, 3)$
C) $(-3, 4)$ D) $(3, 2)$

2) $y = 3x - 5$

$y = \frac{2}{3}x + 2$

- A) $(3, 4)$ B) $(-10, 3)$
C) $(4, 3)$ D) $(-10, 6)$

4) $6x - y = 3$

$x - y = -2$

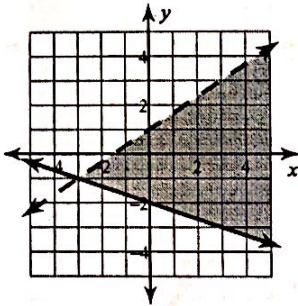
- A) $(-1, 3)$ B) $(-1, -3)$
C) $(1, 3)$ D) $(3, 1)$

Sketch the solution to each system of inequalities.

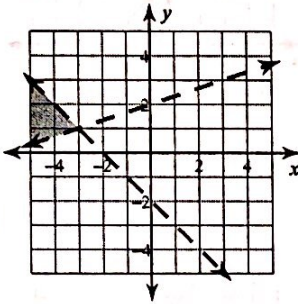
5) $y < -x - 2$

$y > \frac{1}{3}x + 2$

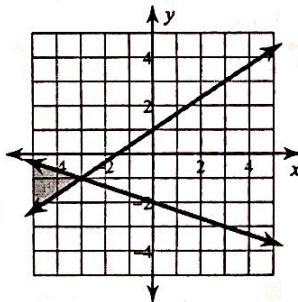
A)



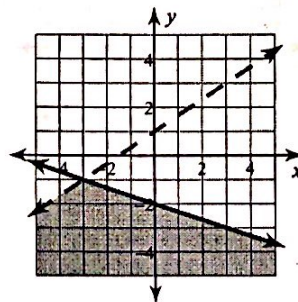
B)



C)



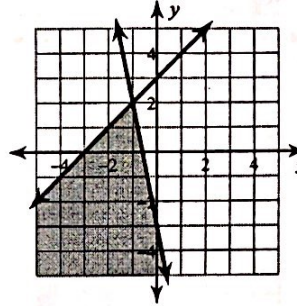
D)



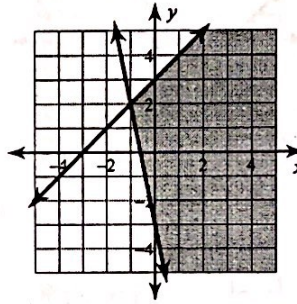
6) $y < \frac{2}{3}x - 3$

$y > -x + 2$

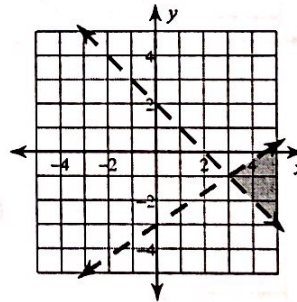
A)



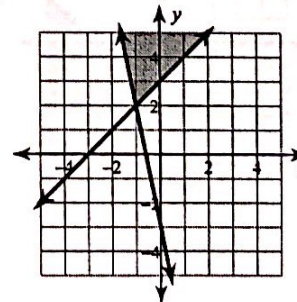
B)



C)

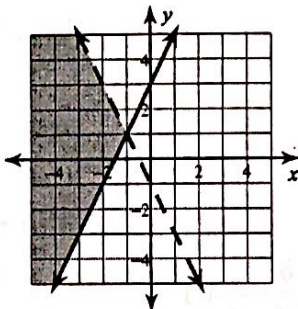


D)

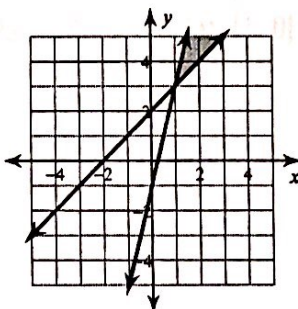


7) $2x - y \leq -3$
 $2x + y < -1$

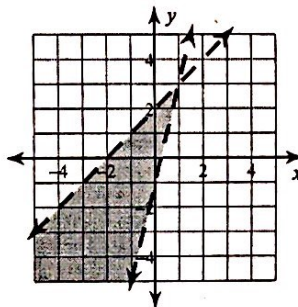
A)



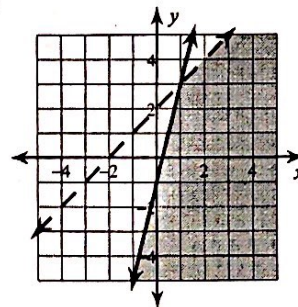
B)



C)

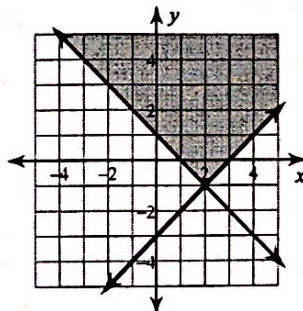


D)

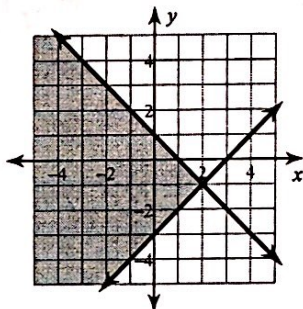


8) $5x - y < -3$
 $x + y \leq -3$

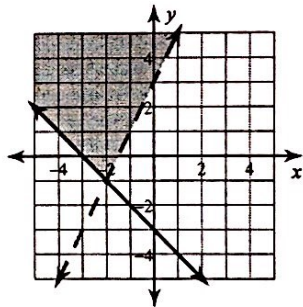
A)



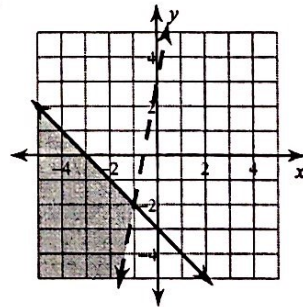
B)



C)



D)



Solve each equation.

9) $|-1 + n| = 2$

- A) $\{3, -1\}$ B) $\{-4\}$
C) $\{12, -12\}$ D) $\{-4, 4\}$

11) $|n + 6| + 2 = 16$

- A) $\{-\frac{16}{3}\}$ B) $\{-\frac{16}{3}, 8\}$
C) $\{8, -20\}$ D) $\{1, 0\}$

10) $|6x + 4| = 14$

- A) $\{\frac{5}{3}, -3\}$ B) $\{1\}$
C) No solution. D) $\{\frac{20}{3}, -6\}$

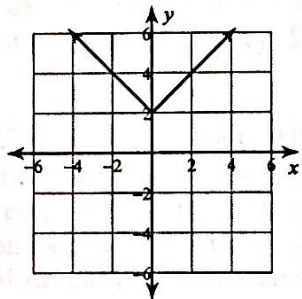
12) $8|-2a - 7| + 6 = 78$

- A) No solution. B) $\{-8, 1\}$
C) $\{\frac{4}{3}, -4\}$ D) $\{-10\}$

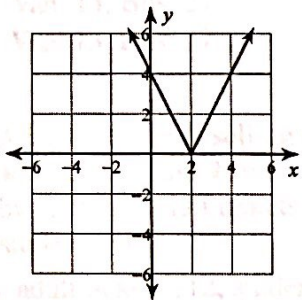
Graph each equation.

13) $y = |2x - 2|$

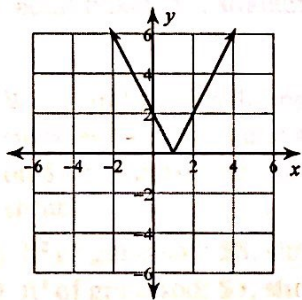
A)



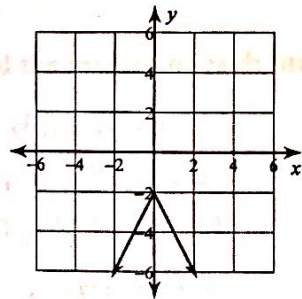
B)



C)

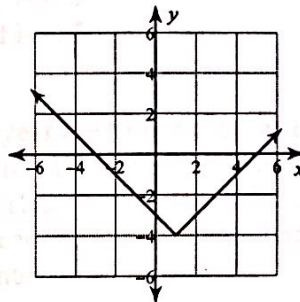


D)

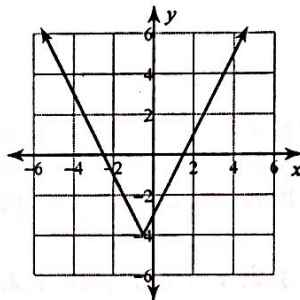


14) $y = |2x + 1| - 4$

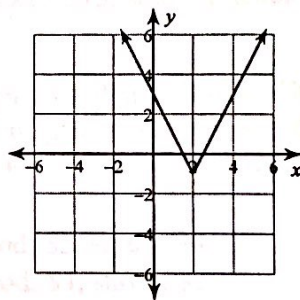
A)



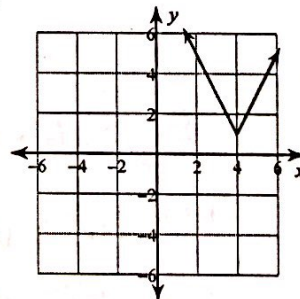
B)



C)



D)



- 15) Imani and Danielle each improved their yards by planting daylilies and ivy. They bought their supplies from the same store. Imani spent \$33 on 9 daylilies and 1 pot of ivy. Danielle spent \$69 on 3 daylilies and 10 pots of ivy. Find the cost of one daylily and the cost of one pot of ivy.
- A) daylily: \$4, pot of ivy: \$2 B) daylily: \$2, pot of ivy: \$7
 C) daylily: \$1, pot of ivy: \$3 D) daylily: \$3, pot of ivy: \$6
- 16) The county fair is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 5 vans and 8 buses with 226 students. High School B rented and filled 3 vans and 4 buses with 118 students. Each van and each bus carried the same number of students. How many students can a van carry? How many students can a bus carry?
- A) Van: 14, Bus: 31 B) Van: 13, Bus: 29
 C) Van: 13, Bus: 27 D) Van: 10, Bus: 22
- 17) Adam's school is selling tickets to a fall musical. On the first day of ticket sales the school sold 4 adult tickets and 9 student tickets for a total of \$179. The school took in \$133 on the second day by selling 8 adult tickets and 3 student tickets. Find the price of an adult ticket and the price of a student ticket.
- A) adult ticket: \$12, student ticket: \$7 B) adult ticket: \$11, student ticket: \$15
 C) adult ticket: \$7, student ticket: \$21 D) adult ticket: \$15, student ticket: \$7
- 18) Willie and Rob each improved their yards by planting grass sod and shrubs. They bought their supplies from the same store. Willie spent \$48 on 4 ft² of grass sod and 7 shrubs. Rob spent \$72 on 8 ft² of grass sod and 8 shrubs. What is the cost of one ft² of grass sod and the cost of one shrub?
- A) ft² of grass sod: \$8, shrub: \$6 B) ft² of grass sod: \$5, shrub: \$4
 C) ft² of grass sod: \$3, shrub: \$3 D) ft² of grass sod: \$4, shrub: \$2

Find the inverse of each function.

19) $g(x) = 4x - 8$

- A) $g^{-1}(x) = -x + 4$
 B) $g^{-1}(x) = -3x - 4$
 C) $g^{-1}(x) = 2 + \frac{1}{4}x$
 D) $g^{-1}(x) = -4x$

20) $f(x) = \frac{5x - 25}{9}$

- A) $f^{-1}(x) = \frac{5x + 15}{7}$
 B) $f^{-1}(x) = -x + 1$
 C) $f^{-1}(x) = \frac{25 + 9x}{5}$
 D) $f^{-1}(x) = \frac{-15 + 4x}{3}$

$$21) f(n) = \sqrt[3]{n-2} - 1$$

- A) $f^{-1}(n) = 2n^3 - 3$
 B) $f^{-1}(n) = \sqrt[3]{\frac{-n+2}{2}}$
 C) $f^{-1}(n) = (n-3)^3$
 D) $f^{-1}(n) = (n+1)^3 + 2$

$$22) f(x) = -2 + (x-1)^2$$

- A) $f^{-1}(x) = -2(x-1)^3$
 B) $f^{-1}(x) = \sqrt{-x-1}$
 C) $f^{-1}(x) = \sqrt{x+3} + 2$
 D) $f^{-1}(x) = \sqrt{x+2} + 1$

Perform the indicated operation.

$$23) h(n) = 3n - 2$$

$$g(n) = -2n^3 + 2n^2$$

Find $\left(\frac{h}{g}\right)(n)$

- A) $\frac{3n-2}{-2n^3+2n^2}$ B) $\frac{-2n^3+2n^2}{3n-2}$
 C) $\frac{2n^3+2n^2}{-3n-2}$ D) $\frac{-4n+5}{n^2-n}$

$$24) g(x) = 3x^3 + 2x^2$$

$$h(x) = 3x - 2$$

Find $(g-h)(x)$

- A) $3x^3 + 2x^2 - 3x + 2$
 B) $-3x^3 + 2x^2 + 3x + 2$
 C) $2x + 8$
 D) $-3x^3 - 2x^2 + 3x - 2$

$$25) f(x) = 2x^2 + 5$$

$$g(x) = 4x - 5$$

Find $(f \cdot g)(x)$

- A) $-8x^3 - 10x^2 - 20x - 25$
 B) $4x^4 - 3x^3 - 12x^2 + 9x$
 C) $2x^3 + 2x^2 - 4x$
 D) $8x^3 - 10x^2 + 20x - 25$

$$26) f(n) = n^2 - 3n$$

$$g(n) = -3n - 4$$

Find $(f+g)(n)$

- A) $n^2 + 6n - 4$ B) $n^2 - n - 3$
 C) $n + 6$ D) $n^2 - 6n - 4$

$$27) f(n) = -n + 1$$

$$g(n) = n^2 - 2n$$

Find $(f \circ g)(-5)$

- A) -14 B) -34
 C) 24 D) -7

$$28) g(x) = 2x - 2$$

$$h(x) = x^2 + 1$$

Find $(g \circ h)(7)$

- A) 50 B) 98
 C) 145 D) 0

$$29) g(t) = 3t - 2$$

$$f(t) = 4t$$

Find $(g \circ f)(t)$

- A) $-12t - 8$ B) $12t - 8$
 C) $12t - 2$ D) $t^2 - 3t + 1$

$$30) h(a) = -3a + 5$$

$$g(a) = 4a + 2$$

Find $(h \circ g)(a)$

- A) $12a + 22$ B) $-12a + 22$
 C) $2a^2 + 7a + 3$ D) $-12a - 1$

31) $f(n) = n + 2$
 $g(n) = -3n^2 + n$
 Find $(f \circ g)(n)$

- A) $2n$
- B) $6n^2 - 14$
- C) $-3n^2 + n + 2$
- D) $-3n^2 - 11n - 10$

32) $f(n) = 2n + 3$
 $g(n) = 3n^2 + 4n$
 Find $(f \circ g)(n)$

- A) $12n^2 + 44n + 39$
- B) $6n^2 - 8n + 3$
- C) $6n^2 + 8n + 3$
- D) $-2n^2 + 2$

Review each equation in logarithmic form.

1) $3^2 = 9$

- A) $\log_3 9 = 2$
- B) $\log_9 3 = 2$
- C) $\log_3 2 = 9$
- D) $\log_9 2 = 3$

2) $49^{\frac{1}{2}} = 7$

- A) $\log_7 49 = \frac{1}{2}$
- B) $\log_7 49 = 2$
- C) $\log_49 7 = \frac{1}{2}$
- D) $\log_49 7 = 2$

Use a calculator to approximate each to the nearest hundredth.

3) $\log_2 10$

- A) 3.32
- B) 3.30
- C) 3.31
- D) 3.33

4) $\log_3 10$

- A) 2.30
- B) 2.31
- C) 2.32
- D) 2.33

5) $\log_5 10$

- A) 1.43
- B) 1.44
- C) 1.45
- D) 1.46

6) $\log_7 10$

- A) 1.50
- B) 1.51
- C) 1.52
- D) 1.53

Write each equation in exponential form.

7) $\log_2 8 = 3$

- A) $2^3 = 8$
- B) $8^3 = 2$
- C) $3^2 = 8$
- D) $8^2 = 3$

8) $\log_3 27 = 3$

- A) $3^3 = 27$
- B) $27^3 = 3$
- C) $3^2 = 27$
- D) $27^2 = 3$

Unit 2 Exam Review

Name _____ ID: 1

Rewrite each equation in exponential form.

1) $\log_{\frac{1}{2}} \frac{1}{64} = 6$

- A) $\left(\frac{1}{2}\right)^6 = \frac{1}{64}$ B) $\left(\frac{1}{2}\right)^{\frac{1}{64}} = 6$
 C) $\left(\frac{1}{64}\right)^6 = \frac{1}{2}$ D) $\left(\frac{1}{64}\right)^{\frac{1}{2}} = 6$

2) $\log_{12} 12 = 1$

- A) $1^{12} = 12$ B) $12^1 = 12$
 C) $7^1 = 12$ D) $12^{12} = 1$

Rewrite each equation in logarithmic form.

3) $13^2 = 169$

- A) $\log_2 13 = 169$
 B) $\log_{13} 169 = 2$
 C) $\log_{169} 13 = 2$
 D) $\log_{169} 2 = 13$

4) $49^{\frac{1}{2}} = 7$

- A) $\log_7 49 = \frac{1}{2}$
 B) $\log_{\frac{1}{2}} 7 = 49$
 C) $\log_{49} 7 = \frac{1}{2}$
 D) $\log_{\frac{1}{2}} 49 = 7$

Use a calculator to approximate each to the nearest thousandth.

5) $\log_3 5.4$

- A) 1.863 B) 1.166
 C) 1.535 D) 2.059

6) $\log_2 5.2$

- A) 3.157 B) 2.02
 C) 2.379 D) 2.973

7) $\log_2 59$

- A) 6.812 B) 8.259
 C) 5.883 D) 7.672

8) $\log 32$

- A) 1.316 B) 1.833
 C) 1.505 D) 0.935

Solve each equation.

9) $\log_8 7a = -2$

- A) $\left\{\frac{122}{121}\right\}$ B) $\left\{\frac{1}{448}\right\}$
 C) $\left\{-\frac{1}{7}\right\}$ D) $\left\{-\frac{625}{4}\right\}$

10) $\log_9 (x + 6) = 1$

- A) $\{-1\}$ B) $\{3\}$
 C) $\left\{\frac{1}{512}\right\}$ D) $\{2391\}$

11) $\log_5 (5x - 2) = 2$

- A) $\left\{\frac{3}{8}\right\}$ B) $\left\{\frac{17}{27}\right\}$
 C) $\left\{\frac{29}{4}\right\}$ D) $\left\{\frac{27}{5}\right\}$

12) $\log_8 (-9x - 5) = 2$

- A) $\left\{-\frac{129}{448}\right\}$ B) $\{4879\}$
 C) $\left\{-\frac{23}{3}\right\}$ D) $\{1\}$

13) $\log_7 (4 - 2x) + 9 = 8$

- A) $\left\{\frac{26}{15}\right\}$ B) $\{-79\}$
 C) $\left\{\frac{27}{14}\right\}$ D) $\left\{\frac{20}{9}\right\}$

14) $10 + \log_4 (-7r - 3) = 14$

- A) $\left\{-\frac{5}{16}\right\}$ B) $\left\{\frac{997}{10}\right\}$
 C) $\left\{\frac{13}{42}\right\}$ D) $\{-37\}$

15) $\log_{12} -2m = \log_{12} (4m + 6)$

- A) $\{-1\}$ B) $\{11\}$
 C) $\{13\}$ D) $\{-2\}$

16) $\log_{19} (8 - 4n) = \log_{19} (7 - 3n)$

- A) $\{1\}$ B) $\left\{\frac{3}{2}\right\}$
 C) $\{10\}$ D) $\{-6\}$

Solve each equation. Round your answers to the nearest ten-thousandth.

17) $\log_9 (x - 4) + \log_9 4 = \log_9 73$

- A) $\{15.25\}$ B) $\{9.2857\}$
 C) $\{22.25\}$ D) $\{88\}$

18) $\log_7 (x + 5) - \log_7 2 = 2$

- A) $\{199\}$ B) $\{113\}$
 C) $\{93\}$ D) $\{30\}$

19) $\log_7 9 - \log_7 (x + 10) = 1$

- A) $\{11.1429\}$ B) $\{-0.0282\}$
 C) $\{-8.7143\}$ D) No solution.

20) $\log_4 8 + \log_4 4x = 4$

- A) $\{8\}$ B) $\{-160\}$
 C) $\{0.1333\}$ D) $\{-80\}$

21) $18^b = 100$

- A) 1.5933 B) 2
 C) 5.1391 D) 4.6052

22) $4^x = 69$

- A) 1.8388 B) 3.0543
 C) 4.2341 D) 3.5762

23) $-4 \cdot 5^{p-3} = -37$

- A) No solution. B) 3.9661
 C) 4.3822 D) 5.2246

24) $14^{-10n} - 6 = 93$

- A) -0.1996 B) -0.4595
 C) -0.1741 D) No solution.

25) $-8e^{4n+3} - 4 = -32$

- A) -0.4368 B) -0.6531
 C) -0.614 D) -0.6248

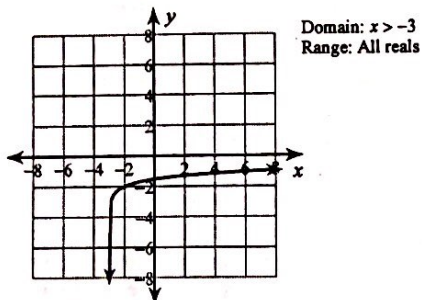
26) $-9e^{7x+6} + 7 = -88.5$

- A) -0.721 B) -0.7001
 C) -0.7106 D) -0.5197

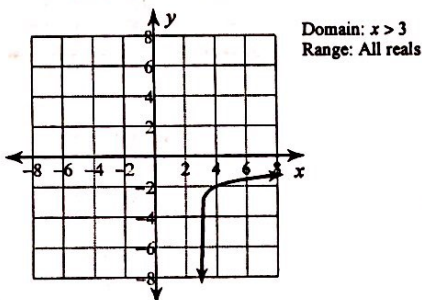
Identify the domain and range of each. Then sketch the graph.

27) $y = \log(x + 3) - 2$

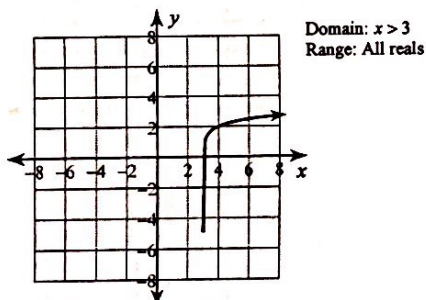
A)



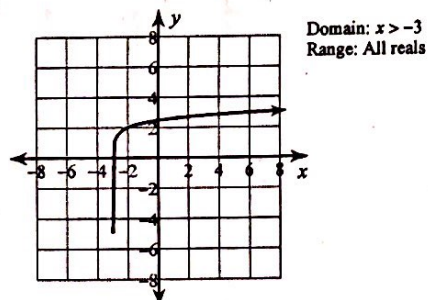
B)



C)

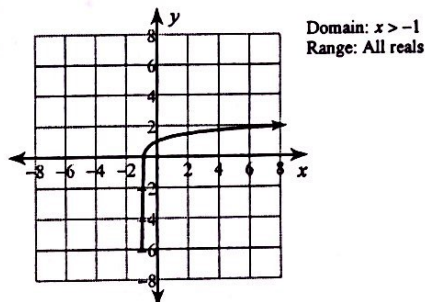


D)

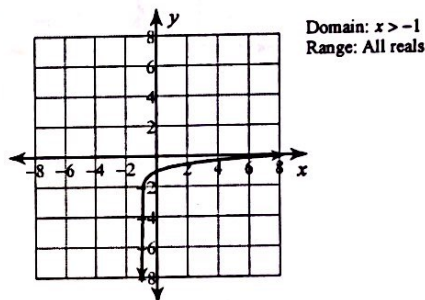


28) $y = \log(x - 1) + 1$

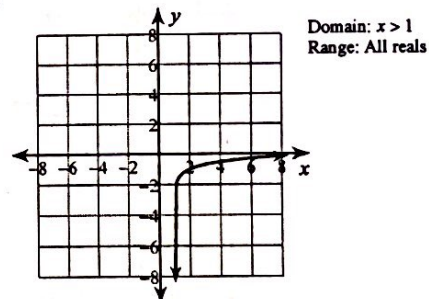
A)



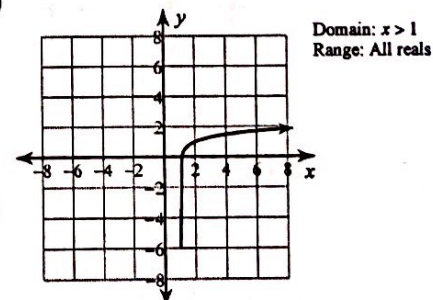
B)



C)

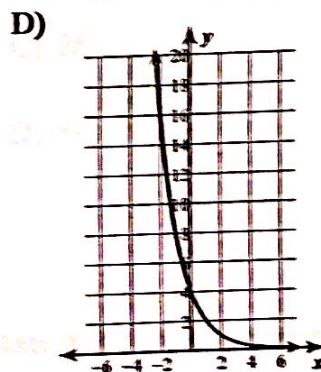
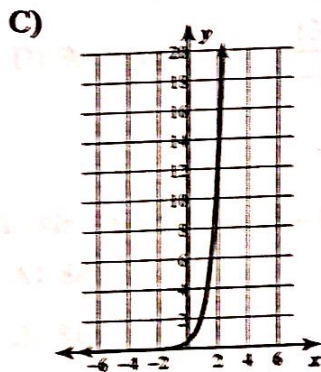
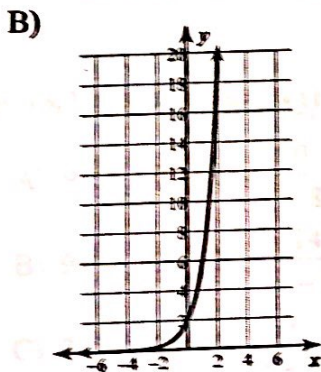
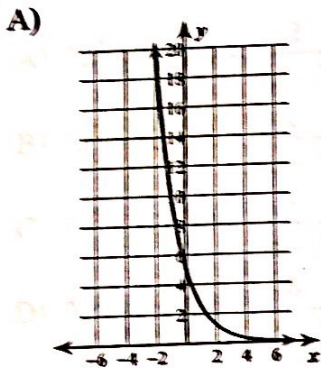


D)

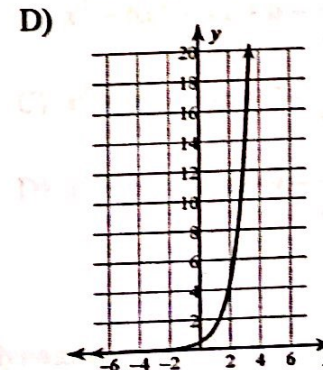
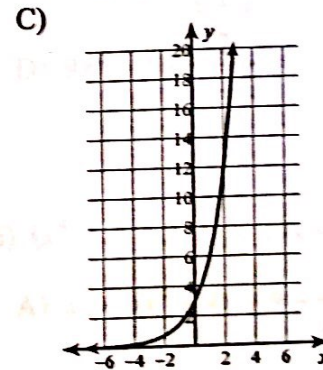
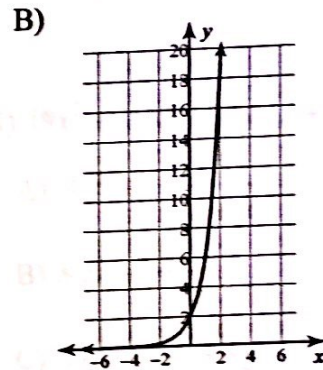
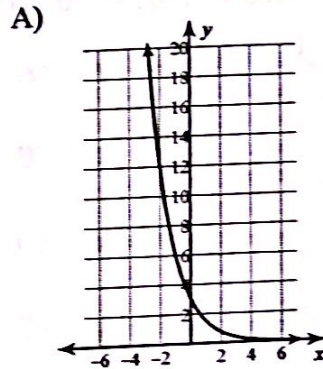


Sketch the graph of each function.

29) $f(x) = 5 \cdot \left(\frac{1}{2}\right)^x$



30) $f(x) = \frac{1}{2} \cdot 3^x$



Unit 4 Exam Review

Name _____ ID: 1

Divide.

1) $(28a^3 - 73a^2 + 74a - 53) \div (4a - 7)$

A) $7a^2 - 6a + 9 - \frac{2}{4a - 7}$

B) $7a^2 - 6a + 5 + \frac{2}{4a - 7}$

C) $7a^2 - 6a + 8 + \frac{3}{4a - 7}$

D) $7a^2 - 6a + 9 + \frac{6}{4a - 7}$

2) $(70v^3 - 107v^2 + 66v - 79) \div (7v - 10)$

A) $10v^2 - v + 6 - \frac{1}{7v - 10}$

B) $10v^2 - v + 8 + \frac{1}{7v - 10}$

C) $10v^2 - v + 5 + \frac{1}{7v - 10}$

D) $10v^2 - v + 8 + \frac{2}{7v - 10}$

3) $(9r^3 - 62r^2 - 89r + 63) \div (r - 8)$

A) $9r^2 + 10r - 6 - \frac{10}{r - 8}$

B) $9r^2 + 10r - 10 - \frac{14}{r - 8}$

C) $9r^2 + 10r - 9 - \frac{9}{r - 8}$

D) $9r^2 + 10r - 12 - \frac{13}{r - 8}$

4) $(9x^3 + 18x^2 - 7) \div (x + 2)$

A) $9x^2 + 3 - \frac{9}{x + 2}$

B) $9x^2 - \frac{7}{x + 2}$

C) $9x^2 - 2 - \frac{9}{x + 2}$

D) $9x^2 - 3 - \frac{2}{x + 2}$

5) $(8k^3 - 64k^2 - 5) \div (k - 8)$

A) $8k^2 - 1$

B) $8k^2 - \frac{9}{k - 8}$

C) $8k^2 - \frac{5}{k - 8}$

D) $8k^2 - 1 - \frac{4}{k - 8}$

6) $(x^4 - x^3 - 26x^2 + 29x + 38) \div (x + 5)$

A) $x^3 - 6x^2 + 4x + 9 - \frac{6}{x + 5}$

B) $x^3 - 6x^2 + 4x + 6 - \frac{2}{x + 5}$

C) $x^3 - 6x^2 + 4x + 7 - \frac{8}{x + 5}$

D) $x^3 - 6x^2 + 4x + 9 - \frac{7}{x + 5}$

State if the given binomial is a factor of the given polynomial.

7) $(12v^4 - 64v^3 + 53v^2 - 56v + 90) \div (2v - 9)$

A) Yes B) No

8) $(2m^3 + 16m^2 + 28m - 26) \div (2m + 8)$

A) Yes B) No

9) $(10k^4 - 73k^3 - 65k^2 + 81k - 74) \div (k - 8)$

- A) No B) Yes

10) $(9m^4 + 62m^3 - 11m^2 - 37m - 63) \div (m + 7)$

- A) Yes B) No

Find all zeros.

11) $f(x) = (x + 3)(x - 1)$

- A) $\left\{-3, \frac{1}{2}\right\}$ B) $\{-1, 1\}$
 C) $\{-3, 1\}$ D) $\{-4, 1\}$

12) $f(x) = (x - 5)(x - 2)$

- A) $\{5, -1\}$ B) $\{5, -4\}$
 C) $\{5, 2\}$ D) $\{5, -3\}$

13) $f(x) = (x + 1)^2$

- A) $\{0 \text{ mult. } 2\}$
 B) $\{-2 \text{ mult. } 2\}$
 C) $\{-1 \text{ mult. } 2\}$
 D) $\left\{-\frac{1}{2} \text{ mult. } 2\right\}$

14) $f(x) = x(x + 2)(x - 2)$

- A) $\{0, -2, 2\}$ B) $\{0 \text{ mult. } 3\}$
 C) $\left\{0, -2, -\frac{3}{2}\right\}$ D) $\{0, -2, -3\}$

Approximate the relative minima and relative maxima of each function to the nearest tenth.

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

- A) Minima: $(0.7, -4.1)$
 Maxima: $(0, -4)$
 B) Minima: $(-2, -2)$
 Maxima: $(0.7, 7.5)$
 C) Minima: $(0, -4)$
 Maxima: $(0.7, -3.9)$
 D) Minima: $(0, 0)$
 Maxima: $(2, 4)$

16) $f(x) = -x^2 + 6x - 6$

- A) Minima: $(-4, -5)$
 Maxima: None
 B) Minima: None
 Maxima: $(3, 3)$
 C) Minima: $(4, 1)$
 Maxima: None
 D) Minima: None
 Maxima: $(3, 1)$

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

- A) Minima: $(2, 0)$
 Maxima: $(0, 4)$
 B) Minima: $(3.7, -6.5)$
 Maxima: $(1, 3)$
 C) Minima: $(1, -6)$
 Maxima: $(3, -2)$
 D) Minima: $(2.7, -2.5)$
 Maxima: $(0, 7)$

18) $f(x) = x^2 + 2x + 1$

- A) Minima: $(-2, -2)$
 Maxima: None
 B) Minima: $(1, -1)$
 Maxima: None
 C) Minima: $(-1, 0)$
 Maxima: None
 D) Minima: None
 Maxima: $(0, -2)$

Describe the end behavior of each function.

19) $f(x) = x^5 - 4x^3 + 3x$

- A) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
- B) $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
- C) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
- D) $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

21) $f(x) = x^2 + 2x$

- A) $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
- B) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
- C) $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
- D) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

Solve.

23) $x^3 - x^2 - 12x = 0$

- A) $\{0, -3, 4\}$
- B) $\left\{0, -3, \frac{4}{3}\right\}$
- C) $\{0, -3, -2\}$
- D) $\left\{0, -\frac{3}{2}, 4\right\}$

25) $x^3 + 4x^2 + 13x = 0$

- A) $\{0, -2 + 3i, -2 - 3i\}$
- B) $\left\{0, \frac{-2 + i\sqrt{35}}{3}, \frac{-2 - i\sqrt{35}}{3}\right\}$
- C) $\{0, -2 + i\sqrt{7}, -2 - i\sqrt{7}\}$
- D) $\{0, -3 + 2i, -3 - 2i\}$

20) $f(x) = -x^2 - 2x - 3$

- A) $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
- B) $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
- C) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
- D) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

22) $f(x) = x^4 + 4x^3 + 3x^2 - 3x - 1$

- A) $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$
- B) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
- C) $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
- D) $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

24) $x^3 + x^2 - 6x = 0$

- A) $\{0, -3 \text{ mult. } 2\}$
- B) $\{0, -3, 2\}$
- C) $\{0, -4, 2\}$
- D) $\left\{0, -4, -\frac{2}{3}\right\}$

26) $x^3 - 6x^2 - x = 0$

- A) $\{0, 3 + \sqrt{10}, 3 - \sqrt{10}\}$
- B) $\{0, -2 + \sqrt{5}, -2 - \sqrt{5}\}$
- C) $\{0, 3 + \sqrt{6}, 3 - \sqrt{6}\}$
- D) $\{0, -4 + \sqrt{17}, -4 - \sqrt{17}\}$

Simplify each expression.

1) $\frac{56}{14n-14}$

A) $\frac{1}{2}$

B) $\frac{4}{n-1}$

C) $\frac{3n-5}{8}$

D) $\frac{8}{3n-5}$

2) $\frac{8k-40}{k-5}$

A) 8

B) $\frac{7k+5}{10}$

C) $\frac{7k-2}{3}$

D) $\frac{1}{8}$

Simplify each and state the excluded values.

3) $\frac{x^2+3x-4}{x^2-6x-40}$

A) $\frac{x-1}{x-10}$; {10, -4}

B) $\frac{x-4}{x+10}$; {-10, -4}

C) $\frac{x+4}{x-9}$; {9, -5}

D) $\frac{x-10}{x-1}$; {1, -4}

4) $\frac{m^2-9}{2m^2+6m}$

A) $\frac{m+4}{4}$; {-7}

B) $\frac{3}{m-6}$; {6, -10}

C) $\frac{2m}{m-3}$; {3, -3}

D) $\frac{m-3}{2m}$; {0, -3}

Simplify each expression.

5) $\frac{21a^3-27a^2}{56a^3-72a^2} \cdot \frac{8a^2}{8}$

A) $\frac{a+9}{6}$

B) $\frac{a+3}{2a^2}$

C) $\frac{3a^2}{8}$

D) 2a

6) $\frac{r+6}{r+7} \cdot \frac{r^2+11r+28}{9r+36}$

A) $\frac{r-5}{r+9}$

B) 3

C) $\frac{2}{5}$

D) $\frac{r+6}{9}$

7) $\frac{9a^2-72a}{a^2-6a-16} \cdot \frac{a+2}{9a-27}$

A) $\frac{1}{9}$

B) $\frac{a}{a-3}$

C) $\frac{1}{6a^2}$

D) $\frac{9}{8}$

8) $\frac{r^2-11r+28}{r^2-5r-14} \cdot \frac{r^2+12r+35}{r^2+3r-28}$

A) $\frac{r+5}{r+2}$

B) $\frac{5}{3(r-5)}$

C) 10

D) $\frac{10}{3(r-6)}$

$$9) \frac{8a^2 + 24a}{a+7} \div \frac{a-2}{a+7}$$

- A) $a-10$ B) $\frac{a-8}{a+1}$
 C) $\frac{a-3}{a-1}$ D) $\frac{8a(a+3)}{a-2}$

$$10) \frac{7}{r-4} \div \frac{9r-72}{9r-36}$$

- A) $\frac{r-2}{r-8}$ B) $\frac{7}{r-8}$
 C) $\frac{9r^2}{r+9}$ D) $28r^2$

$$11) \frac{5x+5}{5x+30} \div \frac{x^2+4x+3}{8x+24}$$

- A) $\frac{8}{x+6}$ B) $\frac{14}{3}$
 C) $x-5$ D) $\frac{x+3}{x-6}$

$$12) \frac{a^2+7a-18}{30a-20} \div \frac{6}{30a-20}$$

- A) $\frac{(a-2)(a+9)}{6}$
 B) $\frac{(a-7)(a+4)}{8a}$
 C) $\frac{1}{a}$
 D) $\frac{5}{(a+8)(a+5)}$

$$13) \frac{n-5}{12n+24} + \frac{5}{12n+24}$$

- A) $\frac{n}{12n+24}$ B) 0
 C) $\frac{n}{6n+12}$ D) $\frac{n}{4n+8}$

$$14) \frac{6}{a+2} - \frac{2}{a-5}$$

- A) $\frac{4a-34}{(a-5)(a+2)}$
 B) $\frac{4}{7}$
 C) $\frac{24-4a-a^2}{(2-a)(2+a)}$
 D) $\frac{12-6a}{(a-5)(a+2)}$

$$15) \frac{2a}{3} + \frac{a+4}{a-4}$$

- A) $\frac{2a^2-5a+12}{3(a-4)}$
 B) $\frac{2a^2+8a}{3(a-4)}$
 C) $\frac{2a^2-7a-4}{3(a+4)}$
 D) $\frac{2a^2+9a-8}{3(a+4)}$

$$16) \frac{3n}{n-6} - \frac{5n}{n+2}$$

- A) $\frac{n^2-36n-5}{(n-5)(n+3)}$
 B) $\frac{n+1}{8}$
 C) $\frac{n^2-37n}{(n-5)(n+3)}$
 D) $\frac{-2n^2+36n}{(n-6)(n+2)}$

Solve each equation. Remember to check for extraneous solutions.

$$17) \frac{n+3}{n} = \frac{1}{2} - \frac{6}{n}$$

- A) $\{-5, 6\}$ B) $\{6\}$
C) $\{-5\}$ D) $\{-18\}$

$$18) \frac{3}{x^2 - 4x - 12} = \frac{5}{x+2} - \frac{1}{x^2 - 4x - 12}$$

- A) $\{1\}$ B) $\{-3\}$
C) $\{3\}$ D) $\left\{\frac{34}{5}\right\}$

$$19) \frac{m+5}{m-6} = \frac{2}{m-6} - 1$$

- A) $\left\{-\frac{5}{4}\right\}$ B) $\{-3\}$
C) $\{-2\}$ D) $\left\{\frac{3}{2}\right\}$

$$20) 1 + \frac{1}{2n} = \frac{5}{2n}$$

- A) $\{2\}$ B) $\left\{\frac{7}{4}\right\}$
C) $\left\{-\frac{3}{2}\right\}$ D) $\{-4\}$

Identify the holes, vertical asymptotes, horizontal asymptote, and domain of each.

21) $f(x) = \frac{-3x^2 - 15x - 18}{x^2 + 3x + 2}$

- A) Vertical Asym.: $x = -3, x = -2$
Holes: None
Horz. Asym.: $y = 0$
Domain: All reals except $-3, -2$
- B) Vertical Asym.: $x = -3$
Holes: $x = -2$
Horz. Asym.: $y = -\frac{1}{3}$
Domain: All reals except $-3, -2$
- C) Vertical Asym.: $x = -2, x = -1$
Holes: None
Horz. Asym.: $y = 0$
Domain: All reals except $-2, -1$
- D) Vertical Asym.: $x = -1$
Holes: $x = -2$
Horz. Asym.: $y = -3$
Domain: All reals except $-2, -1$

22) $f(x) = \frac{x + 3}{2x + 2}$

- A) Vertical Asym.: $x = -3$
Holes: None
Horz. Asym.: $y = 2$
Domain: All reals except -3
- B) Vertical Asym.: $x = -1$
Holes: None
Horz. Asym.: $y = 0$
Domain: All reals except -1
- C) Vertical Asym.: $x = -1$
Holes: None
Horz. Asym.: $y = \frac{1}{2}$
Domain: All reals except -1
- D) Vertical Asym.: $x = -3$
Holes: None
Horz. Asym.: $y = 0$
Domain: All reals except -3

$$23) f(x) = \frac{3x - 9}{x - 4}$$

- A) Vertical Asym.: $x = 4$
Holes: None
Horz. Asym.: $y = 3$
Domain: All reals except 4
- B) Vertical Asym.: $x = 3$
Holes: None
Horz. Asym.: $y = 0$
Domain: All reals except 3
- C) Vertical Asym.: $x = 3$
Holes: None
Horz. Asym.: $y = \frac{1}{3}$
Domain: All reals except 3
- D) Vertical Asym.: $x = 4$
Holes: None
Horz. Asym.: $y = 0$
Domain: All reals except 4

$$24) f(x) = \frac{x^3 - x^2 - 12x}{-2x^2 + 8}$$

- A) Vertical Asym.: $x = 2, x = -2$
Holes: None
Horz. Asym.: $y = 0$
Domain: All reals except $-2, 2$
- B) Vertical Asym.: $x = 2, x = -2$
Holes: None
Horz. Asym.: None
Domain: All reals except $-2, 2$
- C) Vertical Asym.: $x = 2, x = -3$
Holes: None
Horz. Asym.: $y = 1$
Domain: All reals except $-3, 2$
- D) Vertical Asym.: $x = 0, x = 4, x = -3$
Holes: None
Horz. Asym.: $y = 0$
Domain: All reals except $-3, 0, 4$