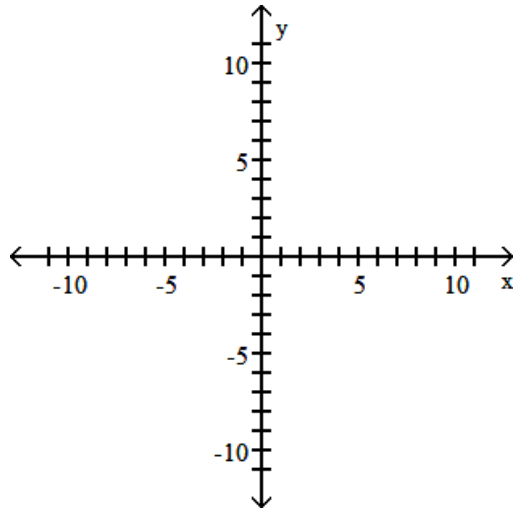


Calculators are NOT allowed on this part of the final. Show work to support each answer. Full credit may not be awarded for questions without any work shown. Each question in this section is worth 10 points.

- 1) Graph the function $f(x) = x^2 + 4x - 5$. Identify the y-intercept and the vertex.



- 2) Find functions f and g so that $f \circ g = H$. $H(x) = \frac{1}{x^2 - 8}$. Do not use the identity function for f or g .

- 3) Solve for x : $2^{x^2 - 3} = 64$.

4) Solve the inequality $\frac{(x - 7)(x + 7)}{x} \leq 0$. Express your answer in interval notation.

5) Express $3 \log_a (2x + 1) - 2 \log_a (2x - 1) + 2$ as a single logarithm.

6) Form a polynomial whose zeros and degree are given.
Zeros: 2, multiplicity 2; -2, multiplicity 2; degree 4

Name: _____

EKU ID: _____

CALCULATOR SECTION. Calculators are allowed on this section.

MULTIPLE CHOICE. Choose the best answer. Circle the correct letter on the answer sheet, and then fill in your circle. Each question in this section is worth 5 points.

7) Find $f(2x)$ when $f(x) = \sqrt{8x^2 - 5x}$.

A) $\sqrt{16x^2 - 10x}$

B) $\sqrt{16x^2 - 20x}$

C) $\sqrt{32x^2 - 10x}$

D) $2\sqrt{8x^2 - 5x}$

8) Find and simplify the difference quotient of f , $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$, for the function

$$f(x) = 3x + 5.$$

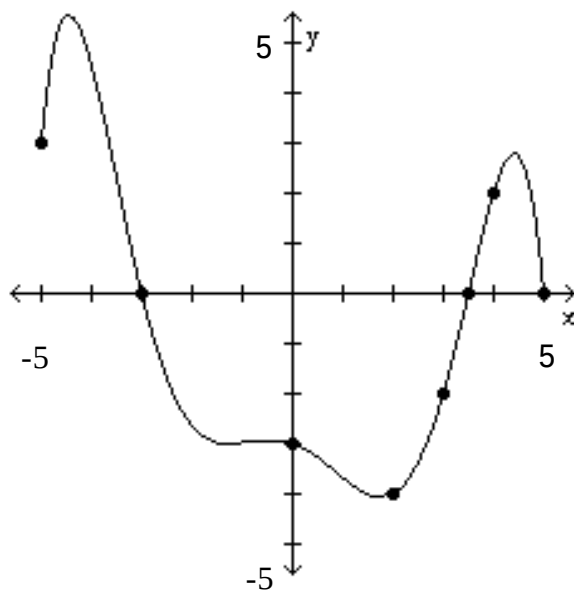
F) $3 + \frac{6(x+5)}{h}$

G) 0

H) 3

J) $3 + \frac{10}{h}$

9) The graph of a function f is given. What is the y-intercept?



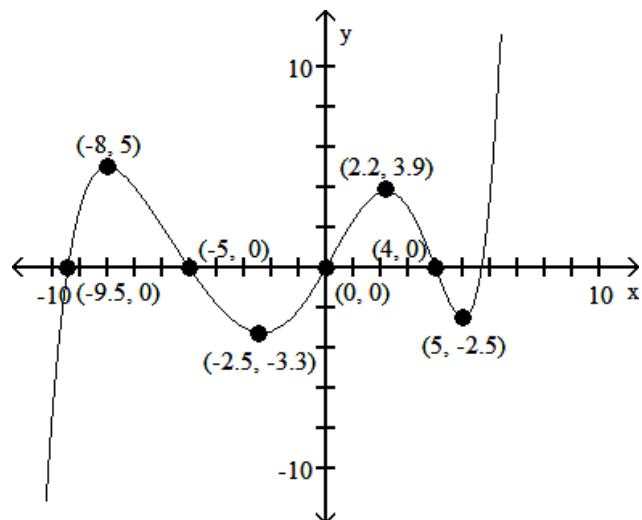
A) -3

B) 3.5

C) -4

D) 5

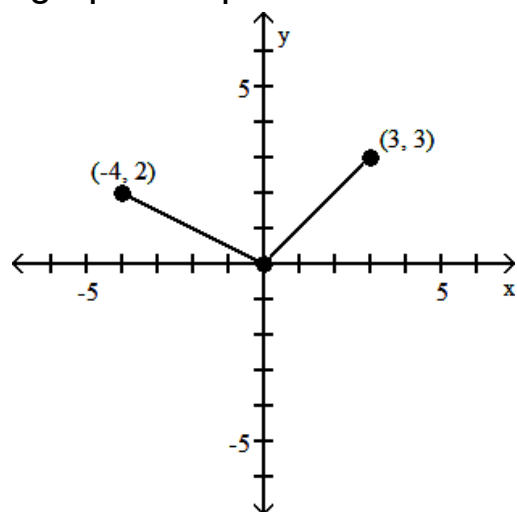
10)



Find the numbers, if any, at which f has a local maximum. What are the local maxima?

- F) f has a local maximum at $x = -8$ and 2.2 ; the local maximum at -8 is 5 ; the local maximum at 2.2 is 3.9
- G) f has a local maximum at $x = 5$ and 3.9 ; the local maximum at 5 is -8 ; the local maximum at 3.9 is 2.2
- H) f has a local minimum at $x = -8$ and 2.2 ; the local minimum at -8 is 5 ; the local minimum at 2.2 is 3.9
- J) f has a local minimum at $x = 5$ and 3.9 ; the local minimum at 5 is -8 ; the local minimum at 3.9 is 2.2

11) The graph of a piecewise-defined function is given. Write a rule for the function.



A)

$$f(x) = \begin{cases} \frac{1}{2}x & \text{if } -4 < x < 0 \\ x & \text{if } 0 < x < 3 \end{cases}$$

C)

$$f(x) = \begin{cases} -\frac{1}{2}x & \text{if } -4 < x < 0 \\ x & \text{if } 0 < x < 3 \end{cases}$$

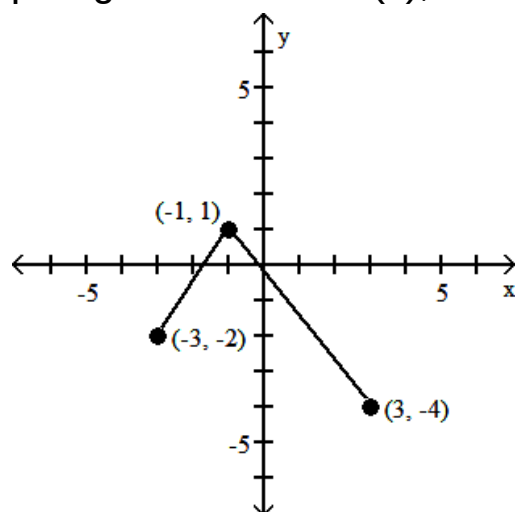
B)

$$f(x) = \begin{cases} -\frac{1}{2}x & \text{if } -4 \leq x \leq 0 \\ x & \text{if } 0 < x \leq 3 \end{cases}$$

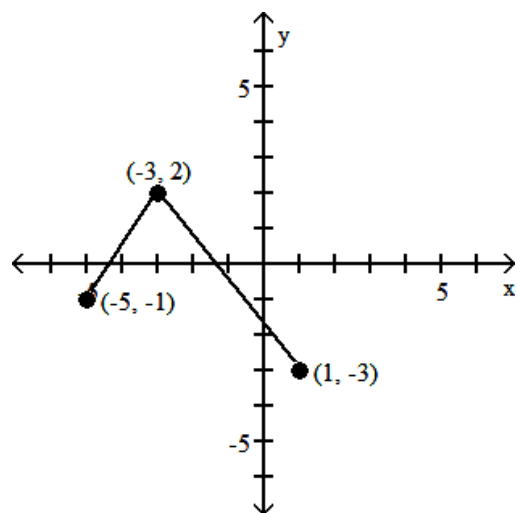
D)

$$f(x) = \begin{cases} -2x & \text{if } -4 \leq x \leq 0 \\ x & \text{if } 0 < x \leq 3 \end{cases}$$

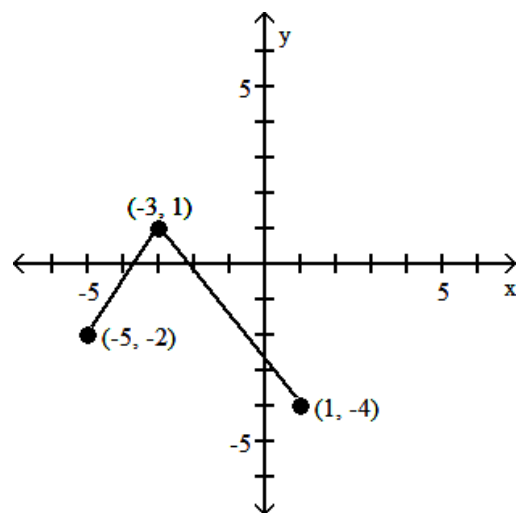
- 12) The graph of a function f is illustrated. Use the graph of f as the first step toward graphing the function $F(x)$, where $F(x) = f(x + 2) - 1$.



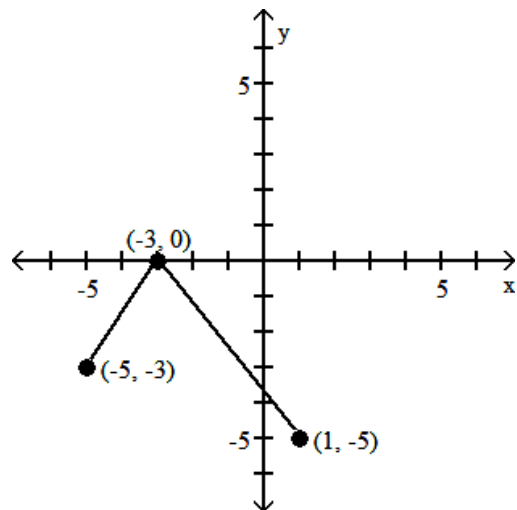
F)



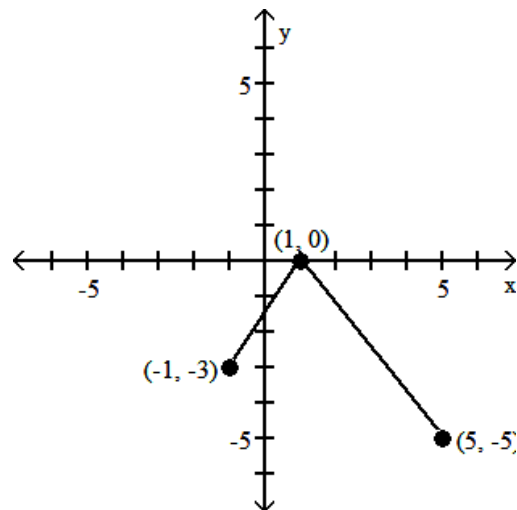
G)



H)



J)



- 13) A wire of length $6x$ is bent into the shape of a square. Express the area A of the square as a function of x .

A) $A(x) = \frac{9}{2}x^2$

B) $A(x) = \frac{1}{16}x^2$

C) $A(x) = \frac{3}{2}x^2$

D) $A(x) = \frac{9}{4}x^2$

14) $f(x) = 7x + 8$

$g(x) = x^2$

Find the x-values for the points of intersection of the graphs of the two functions.

F) $x = -1, x = \frac{1}{8}$

G) $x = -1, x = 8$

H) $x = 1, x = 8$

J) $x = 1, x = -\frac{1}{8}$

15) To convert a temperature from degrees Celsius to degrees Fahrenheit, you multiply the temperature in degrees Celsius by 1.8 and then add 32 to the result. Express F as a linear function of c.

A) $F(c) = \frac{c - 32}{1.8}$

B) $F(c) = 33.8c$

C) $F(c) = 1.8 + 32c$

D) $F(c) = 1.8c + 32$

16) Find the vertex and axis of symmetry of the graph of the function $f(x) = -x^2 + 4x$.

F) $(-4, 2); x = -4$

G) $(4, -2); x = 4$

H) $(2, 4); x = 2$

J) $(-2, -4); x = -2$

17) Solve the inequality $x^2 - 3x \geq 4$. Express your answer using interval notation.

A) $[-1, 4]$

B) $(-\infty, -1]$

C) $(-\infty, -1] \cup [4, \infty)$

D) $[4, \infty)$

18) Find the domain and range of the function $f(x) = (x + 3)^2 + 8$.

F) Domain: $(8, \infty)$; range: $(-\infty, \infty)$

G) Domain: $(-\infty, \infty)$; range: $[8, \infty)$

H) Domain: $(-8, \infty)$; range: $(-\infty, \infty)$

J) Domain: $(-\infty, \infty)$; range: $(-8, \infty)$

19) Find the complex zeros of the quadratic function $g(x) = 5x^2 - x + 6$.

A) $x = -\frac{1}{5}, x = \frac{1}{6}$

B) $x = 1 \pm \sqrt{119}$

C) $x = \frac{1}{5} \pm \frac{\sqrt{119}}{5}i$

D) $x = \frac{1}{10} \pm \frac{\sqrt{119}}{10}i$

20) Solve the inequality $|6x - 3| \leq 2$. Express your answer using interval notation.

F) $[\frac{1}{6}, \frac{5}{6}]$

G) $(-\infty, \frac{5}{6}]$

H) $(-\infty, \frac{1}{6}] \cup [\frac{5}{6}, \infty)$

J) $(\frac{1}{6}, \frac{5}{6})$

21) Find the domain of the rational function $h(x) = \frac{5x}{(x + 8)(x - 1)}$.

A) all real numbers

B) $\{x | x \neq -8, x \neq 1, x \neq -5\}$

C) $\{x | x \neq 8, x \neq -1\}$

D) $\{x | x \neq -8, x \neq 1\}$

22) Find the vertical asymptotes of the rational function $f(x) = \frac{-2x(x+2)}{2x^2 - 7x - 9}$.

- F) $x = \frac{2}{9}, x = -1$ G) $x = -\frac{9}{2}, x = 1$ H) $x = \frac{9}{2}, x = -1$ J) $x = -\frac{2}{9}, x = 1$

23) Give the equation of the horizontal asymptote, if any, of the function $h(x) = \frac{4x^3 - 6x - 9}{5x + 6}$.

- A) $y = 0$ B) $y = 4$
C) $y = \frac{4}{5}$ D) no horizontal asymptotes

24) Give the equation of the oblique asymptote of the function $f(x) = \frac{2x^3 + 11x^2 + 5x - 1}{x^2 + 6x + 5}$.

- F) $y = 2x$ G) $y = 0$ H) $y = 2x - 1$ J) $y = 2x + 1$

25) Give all possible rational zeros for the polynomial $P(x) = 2x^3 - 5x^2 + kx - 19$, where k is an integer.

- A) $\pm 1, \pm 2, \pm 19$ B) $\pm 1, \pm 2, \pm 19, \pm 19/2$
C) $\pm 1, \pm 1/19, \pm 2, \pm 2/19$ D) $\pm 1, \pm 19, \pm 1/2, \pm 19/2$

26) Suppose that a polynomial function of degree 5 with rational coefficients has $-1, i$, and $2i$ as zeros. Find the other zero(s).

- F) $1, -i, -2i$ G) $1, -2i$ H) $-i, -2i$ J) $1, -i$

27) $f(x) = 5x^4 - 40x^3 + 81x^2 - 8x + 16$. Find all of the real zeros of the polynomial function f and use the real zeros to factor f over the real numbers.

- A) no real roots; $f(x) = (x^2 + 16)(5x^2 + 1)$
B) -4 , multiplicity 2; $f(x) = (x + 4)^2(5x^2 + 1)$
C) $-4, 4$; $f(x) = (x - 4)(x + 4)(5x^2 + 1)$
D) 4 , multiplicity 2; $f(x) = (x - 4)^2(5x^2 + 1)$

28) The function $f(x) = \frac{7}{x - 7}$ is one-to-one. Find its inverse.

- F) $f^{-1}(x) = \frac{-7 + 7x}{x}$ G) $f^{-1}(x) = \frac{-7 + 7x^2}{x}$
H) $f^{-1}(x) = \frac{7x + 7}{x}$ J) $f^{-1}(x) = \frac{x}{-7 + 7x}$

29) $f(x) = \frac{4}{x+2}$ and $g(x) = \frac{7}{5x}$. Find $(f \circ g)(x)$.

A) $\frac{7x+14}{20x}$

B) $\frac{4x}{7+10x}$

C) $\frac{20x}{7+10x}$

D) $\frac{20x}{7-10x}$

30) The function $f(x) = 600(0.5)^{x/60}$ models the amount in pounds of a particular radioactive material stored in a concrete vault, where x is the number of years since the material was put into the vault. Find the amount of radioactive material in the vault after 90 years. Round to the nearest whole number.

F) 200 pounds

G) 378 pounds

H) 450 pounds

J) 212 pounds

31) Solve $|36x| = 6x^2$. Give the solution set.

A) $\{0, 6, -6\}$

B) $\{0, 6\}$

C) $\{0, -6\}$

D) No real solutions

32) Find the domain of the function $f(x) = 3 - \ln(7x)$

F) $(-\infty, 3) \cup (7, \infty)$

G) $(-3, 7)$

H) $(0, \infty)$

J) $(7, \infty)$

33) Write $\log_8 \frac{3\sqrt{m}}{n}$ as the sum and/or difference of logarithms. Express powers as factors.

A) $\log_8 3 \cdot \frac{1}{2} \log_8 m \div \log_8 n$

B) $\log_8 3 + \frac{1}{2} \log_8 m - \log_8 n$

C) $\log_8 (3\sqrt{m}) - \log_8 n$

D) $\log_8 n - \log_8 3 - \frac{1}{2} \log_8 m$

34) Solve for x : $\log_3 x + \log_3(x - 24) = 4$

F) No real solutions

G) $x = -3$ or $x = 27$

H) $x = 27$

J) $x = 53$