Summer Review of Trigonometry and Pre-Calculus Concepts

This is not intended to frighten you or make you reconsider taking Calculus. It's meant to help you review some concepts we will use in Calculus so your skills do not become too rusty over the summer. If anything, this should make you all the more successful in Calculus. The format for these questions will be used on most class tests. The Advanced Placement Calculus exam that you might choose to take in May also uses questions of this format.

This is due the first day back!!!! If, over the summer, you need help or have questions about this, go to my web page http://fhn.fhsd.k12.mo.us/swillott and look around at some of the links or send me an email.

Part I, The multiple choice part:

1.

The domain of $f(x) = \dfrac{x-1}{x^2+1}$ is

A. $(-\infty,1) \cup (1,\infty)$ B. $(-\infty,-1) \cup (-1,1) \cup (1,\infty)$

C. $(-\infty,-1) \cup (-1,\infty)$ D. $(1,\infty)$ E. $(-\infty,\infty)$

2.

The domain of $f(x) = \dfrac{\sqrt{x-2}}{x^2-x}$ is

A. $\{x \mid x \neq 0,\ x \neq 1\}$ B. $\{x \mid x \geq 2,\ x \neq 0,\ x \neq 1\}$

C. $\{x \mid x \geq 2\}$ D. $\{x \mid x \geq 2\}$ E. $\{x \mid x > 2\}$

3.

The domain of $f(x) = \dfrac{1}{\sqrt{1-x}}$ is

A. $\{x \mid x \geq 0\}$ B. $\{x \mid x \leq 1\}$

C. $\{x \mid x \geq 1\}$ D. $\{x \mid x < 1\}$ E. $\{x \mid x > 1\}$

4.

The set of zeros of $f(x) = x^3 + 4x^2 + 4x$ is

A. $\{-2\}$ B. $\{0,-2\}$ C. $\{0,2\}$ D. $\{2\}$ E. $\{-2,2\}$

5.

The values of x for which the graphs of $y = x + 2$ and $y^2 = 4x$ intersect are

A. -2 and 2 B. -2 C. 2 D. 0 E. none of these

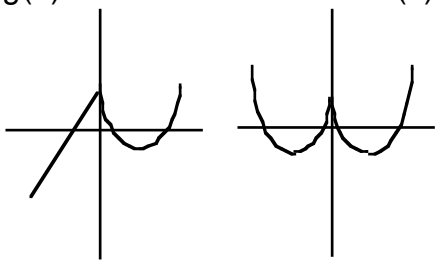
6.

For what values of x is $(3x^2 + 6x)(2x - 5) < 0$?

A. $(-\infty,-2) \cup (0,\frac{5}{2})$ B. $(-2,0)$ C. $(-2,\frac{5}{2})$ D. $(-2,0) \cup (\frac{5}{2},\infty)$ E. $(-2,\infty)$

7.
How is g(x) related to f(x)?

g(x) f(x)



A. $g(x) = f(|x|)$ B. $g(x) = |f(x)|$ C. $g(x) = f(-x)$ D. $g(x) = -f(x)$ E. $g(x) = f(x)$

8.
The graph of $y^2 \square 3y \square 2 = x^2$ is a(n)

A. parabola B. circle C. hyperbola D. ellipse E. line

9.
Which parabolas open upward?

I. $y = -2x^2 + 5x$

II. $y = 3 + 5x - 6x^2$

III. $y = 3x^2$

A. I only

B. II only

C. III only

D. I and II only

E. II and III only

10.
If $h(x) = f(g(x))$, where $f(x) = 3x^2 - 1$ and $g(x) = |x|$, then $h(x) =$

A. $3x^2 - |x|$ B. $|3x^2 - 1|$ C. $3x^2|x| - 1$ D. $3|x| - 1$ E. $3x^2 - 1$

11.
What is $\lim_{x \square 4} \sqrt[3]{\frac{7x}{x-3}}$?

A. 1 B. $\sqrt[3]{7}$ C. 3 D. $\sqrt[3]{28}$ E. The limit does not exist.

12.
What is $\lim_{x \square 2} \frac{x^2 - 4}{x^2 + 4}$?

A. 1 B. 0 C. $-\frac{1}{2}$ D. -1 E.

13.

What is $\lim_{x\to} \frac{4-x^2}{x^2-1}$?

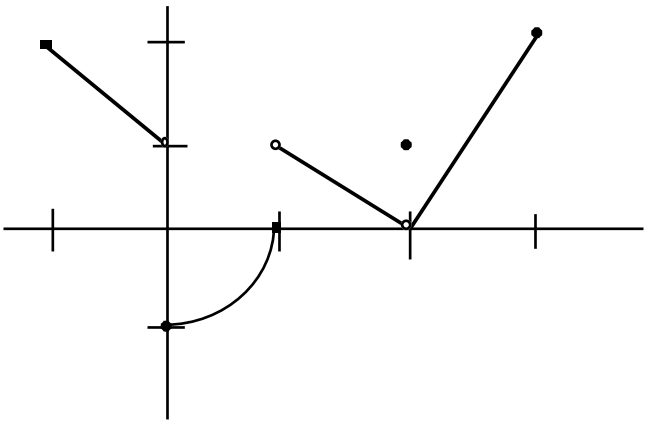
A. 1 B. 0 C. -4 D. -1 E.

14.

What is $\lim_{x\to 3} \frac{x-3}{x^2-2x-3}$?

A. 1 B. 0 C. $\frac{1}{4}$ D. E. none of these

Questions 15 through 17 are based on the function f shown in the graph below. Assume that the graph is shown for x values from –1 to 3 and y values from –1 to 2.



15.

$\lim_{x\to 2} f(x)$

A. equals 0 B. equals 1 C. equals 2 D. does not exist E. none of these

16.

On the interval $[-1, 0)$, the function can be defined as

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

D. $f(x) = -x-1$ E. $f(x) = x-1$

17.

$f(0) =$

A. 1 B. 0 C. f(1) D. -1 E. none of these

18.

The graph of $f(x) = \frac{4}{x^2-1}$ has

A. one vertical asymptote, at $x = 1$.

B. the y - axis as a vertical asymptote.

C. the x - axis as a horizontal asymptote and $x = \pm 1$ as vertical asymptotes.

D. two vertical asymptotes, at $x = \pm 1$, but no horizontal asymptotes.

E. no asymptotes.

19.

If the graph of $y = \dfrac{ax + b}{x + c}$ has a horizontal asymptote $y = 2$ and a vertical asymptote $x = -3$, then $a + c =$

A. -5 B. -1 C. 0 D. 1 E. 5

20.

The derivative, $f'(x)$, of the function $f(x) = 3x^2 + 2x$ is

A. $f'(x) = x^3 + \dfrac{1}{2}x^2$ B. $f'(x) = 6x + \dfrac{1}{2}x^2$ C. $f'(x) = x^3 + x^2$

D. $f'(x) = 6x + 2$ E. $f'(x) = 6x + 2x$

21.

If $f(x) = \left(x^2 - 2x - 1\right)^{\frac{2}{3}}$, then $f'(0)$ is

A. $\dfrac{4}{3}$ B. 0 C. $-\dfrac{2}{3}$ D. $-\dfrac{4}{3}$ E. -2

22.

If $y = \dfrac{2 - x}{3x + 1}$, then the derivative, y' is

A. $y' = -\dfrac{7}{(3x+1)^2}$ B. $y' = \dfrac{6x - 5}{(3x+1)^2}$ C. $y' = -\dfrac{9}{(3x+1)^2}$

D. $y' = \dfrac{7}{(3x+1)^2}$ E. $y' = \dfrac{7 - 6x}{(3x+1)^2}$

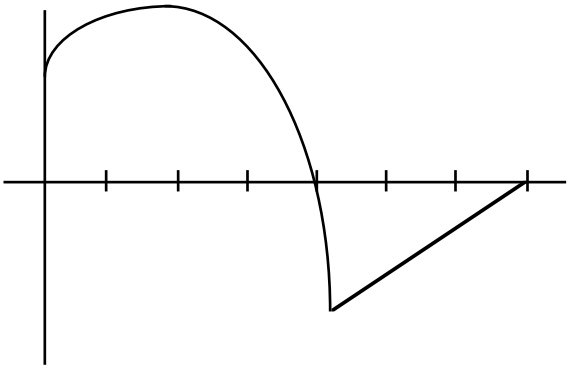
23.

The derivative of a function, y' or $f'(x)$, can also be denoted $\dfrac{dy}{dx}$. If $y = 3x^{\frac{2}{3}} - 4x^{\frac{1}{2}} - 2$, then the derivative of the function is

A. $\dfrac{dy}{dx} = 2x^{\frac{1}{3}} - 2x^{-\frac{1}{2}}$ B. $\dfrac{dy}{dx} = 3x^{-\frac{1}{3}} - 2x^{-\frac{1}{2}}$ C. $\dfrac{dy}{dx} = \dfrac{9}{5}x^{\frac{5}{3}} - 8x^{\frac{3}{2}}$

D. $\dfrac{dy}{dx} = \dfrac{2}{x^{\frac{1}{3}}} - \dfrac{2}{x^{\frac{1}{2}}} - 2$ E. $\dfrac{dy}{dx} = 2x^{-\frac{1}{3}} - 2x^{-\frac{1}{2}}$

24.
The function f whose graph is shown below has $f'(x) = 0$ at x =



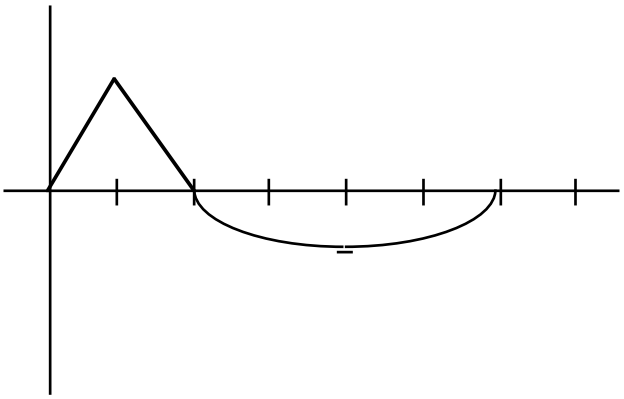
A. 2 only B. 2 and 5 C. 4 and 7 D. 2, 4, and 7 E. 2, 4, 5, and 7

25.
A function f has the values shown. Estimate $f'(1.5)$.

x	1.0	1.2	1.4	1.6
f(x)	8	10	14	22

A. 8 B. 12 C. 18 D. 40 E. 80

26.
The function f whose graph is shown below has $f'(x) = 0$ at x =



A. 1 only B. 2 only C. 4 only D. 1 and 4 E. 2 and 6

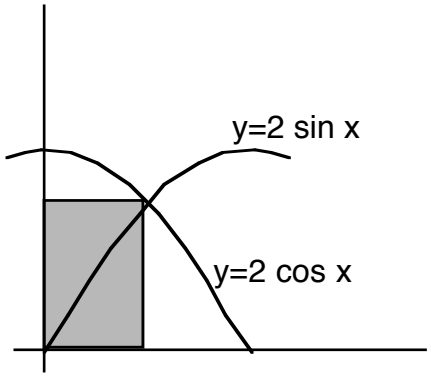
27.
If $\cos\theta = \frac{1}{3}$ and $0 < \theta < \frac{\pi}{2}$ then what is the value of $\sin\theta$?

A. $\frac{1}{3}$ B. $\frac{2}{3}$ C. $-\frac{1}{3}$ D. $\frac{2\sqrt{2}}{3}$ E. none of these

28.
Describe the behavior of the graph of $y = \sin x$ as x increases on the interval $\left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$.

A. strictly decreasing B. descreases, then increases C. strictly increasing
D. increases, then decreases E. none of the above

29.
Of the following, which best approximates the area of the shaded rectangle in the figure below?

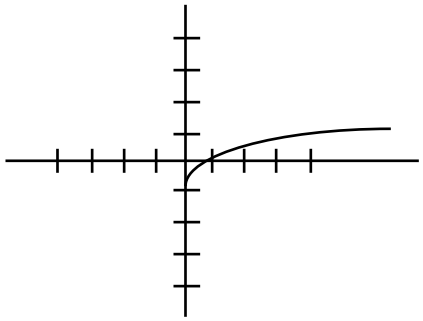


A. 1.414 B. 1.111 C. 0.785 D. 0.707 E. 0.555

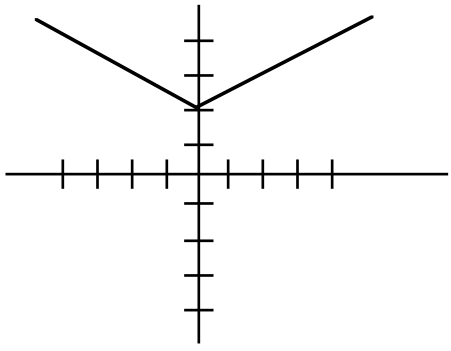
30.
Let $f(x) = \frac{1}{k}\cos(kx)$. For what value of k does f have a period of 3?

A. $\frac{2}{3}$ B. $\frac{2\pi}{3}$ C. $\frac{3\pi}{2}$ D. 6 E. 6π

Part II, The free response part:
31.
Use the graph of the function $y = f(x) = \sqrt{x} - 1$, shown below, to find the domain and range.



32.
What is the domain of the function graphed below? What is the range?



33.

Where do the graphs of $y = \sqrt{4x+9} - 3$ and $y = 4x$ intersect?

34.

Given that $f(x) = 3x^2 - 5x$, find and simplify

A. $f(-2)$

B. $f(2a+b)$

C. $\dfrac{f(x+\Delta x) - f(x)}{\Delta x}$

35.

Consider the function $f(x) = \dfrac{2x^2 - x^3}{x^3 - 3x^2 - 4x + 12}$

A. Give the zeros of f(x).

B. Give the equations of any vertical asymptotes.

C. Give the equations of any horizontal asymptotes.

D. Make a sketch of the graph.

36.

What is $\lim\limits_{x \to 1} \dfrac{x^2 + x - 2}{x^2 - 1}$?

37.

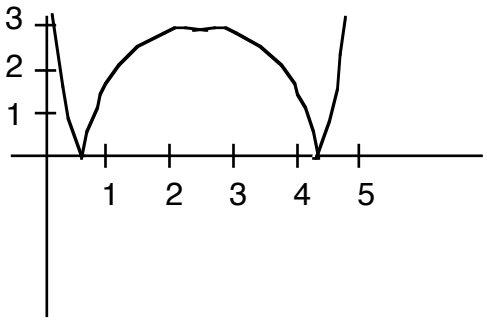
What is $\lim\limits_{x \to 4} \dfrac{\sqrt{x} - 2}{x - 4}$?

38.

By definition, $f'(x) = \dfrac{f(x+\Delta x) - f(x)}{\Delta x}$. Use this definition (not shortcuts) to show that the derivative of $f(x) = 3x^2 + x$ is $f'(x) = 6x + 1$.

39.

The graph of y = f(x) appears below. Use it to sketch the graph of $y = \frac{1}{f(x)}$ on the same set of axes.



40.

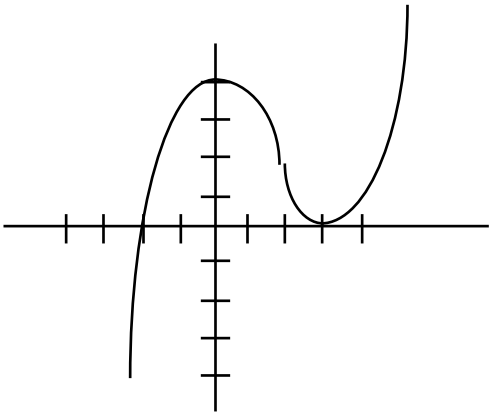
Give an example of an even function other than a constant function.

41.

Rewrite $\sqrt[3]{(x+2)^4}$ using a rational exponent instead of a radical.

42.

The graph of y = f(x) appears below. Use it to sketch the graph of y = f(–x) on the same set of axes.



43.

Consider the polynomial $P(x) = 2x^3 + 3x^2 - 8x + 3$ in answering the following:

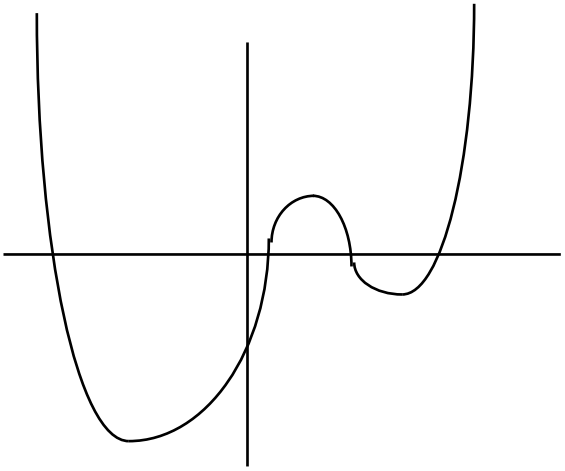
A. Verify x = 1 is a root of the polynomial.

B. Use polynomial long division or synthetic division and the information from part A to determine a polynomial Q(x) such that P(x) = (x – 1)Q(x).

C. Completely factor P(x).

44.
A polynomial P(x) has a zero of multiplicity one (a single root) at x = 2 and a zero of multiplicity two (a double root) at x = –1. It has the property that P(x) □ as x □ and P(x) □ as x □ – . What is the minimum degree of P(x). It may be helpful to sketch a graph.

45.
Determine the lowest possible degree for the polynomial graphed below.



46.
Values of the functions f and g are given in the table below. Find the value of f(g(3)).

x	f(x)	g(x)
1	5	3
2	1	5
3	4	2
4	2	1
5	3	4

47.
Find an equation for the straight line which passes through the points (3, 2) and (5, –2).

48.
Graph the function $y = \sin x$ on the interval where x is between $-\frac{\pi}{2}$ and $\frac{\pi}{2}$.

49.
Explain the effect of a, b, and c on the graph of $g(x) = a \sin(bx) + c$.

50.
If $\frac{\pi}{2} < x < \frac{3\pi}{4}$, determine whether tan x is less than -1 or greater than -1.