**MTH 122 (College Algebra) Proficiency Test**
**Practice Exam**
**(created summer 2009, Department of Mathematics, GVSU)**

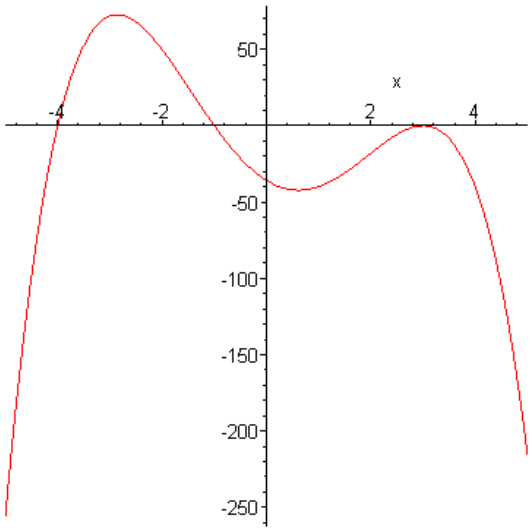
To demonstrate proficiency in MTH 122, a student must successfully solve problems that deal with the following topics: functions and their graphs, including polynomial, rational, radical, exponential, logarithmic, and inverse functions; equations of circles; sequences and series; graphic, numeric, and symbolic methods to understand and solve equations, inequalities, and systems of nonlinear equations.

This practice exam is a bit more difficult than the actual exam. **Answers to these problems are at the end of this document.** You can use a calculator on this exam.

1. If $f(x) = x^2$ and $g(x) = 3x - 4$, find $g(f(f(2)))$.

A) 4 B) 44 C) 16 D) 8 E) 64

2. Assuming that the curve does not touch the $x$-axis outside of the interval shown, which one of the following statements cannot be true about this polynomial function?




A) It has even degree.
B) The multiplicity of the zero at $x = 3$ is at least two.
C) It has a horizontal asymptote.
D) $f(0)$ is negative.
E) It has a local maximum.

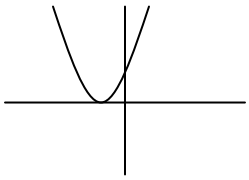
3. What is the domain of this function: $\dfrac{\sqrt{2x+6}}{x}$?

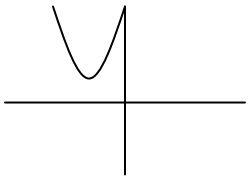
A) $\{x \mid x > -3\}$ B) all real numbers C) $\{x \mid x > 0\}$
D) $\{x \mid x \geq -3\}$ E) $\{x \mid x \geq -3 \text{ and } x \neq 0\}$

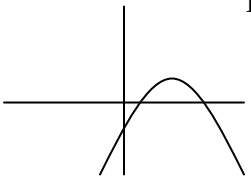
4. What is the slope of a line parallel to the line with equation $5x - 2y = 100$?

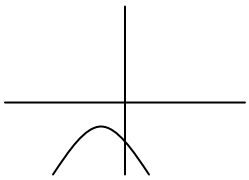
A) 2.5 B) –2.5 C) 0.4 D) –0.4 E) 50

5. Which of the following graphs best represents $f(x) = ax^2 + bx + c$, where $a < 0$ and $b^2 - 4ac < 0$?

A) 

B) 

C) 

D) 

E) none of these

6. Which of the following is a polynomial whose roots are $2i$, $-2i$, and 5?

A) $x^3 - 5x^2 - 4x + 20$
B) $x^2 + 5x + 2$
C) $x - 5$
D) $x^3 - 5x^2 + 4x - 20$
E) none of these

7. If $f(x) = \dfrac{2+x}{5x}$, then as $x$ approaches infinity, what is the behavior of $f(x)$?

A) A horizontal asymptote of $y = 3/5$.
B) A vertical asymptote of 0.
C) $f(x)$ also approaches infinity.
D) A horizontal asymptote of $y = 1/5$.
E) A slant asymptote of $y = 2/5x$.

8. Of the following, which best approximates the solution of the equation $2^{5000} = 10^x$?

A) 1000.000 B) 1505.150 C) 3465.736 D) 16609.640 E) There is no value of $x$ that satisfies this equation.

9. If $Q = \log_{10}(0.01)$, $R = \log_3(1)$, and $S = \ln(e^6)$, then the value of $Q + R + S$ is:

A) 4 B) 8 C) 5 D) 0 E) none of these

10. If $f(x) = 4x - 9$, then what is the value of $f^{-1}(4)$

A) –5 B) 0.2 C) 3.25 D) 25 E) –8

11. Determine the radius of this circle: $x^2 + 8x + y^2 - 20y = 284$.

A) $\sqrt{284}$ B) 20 C) 8 D) $\sqrt{758}$ E) 17

12. An arithmetic sequence begins –40, –29, –18, –7, …. What is the 2009th term in the sequence?

A) 22047 B) 22048 C) 22059 D) 22099 E) none of these

13. Determine the exact sum of this infinite series: 100 + 40 + 16 + 6.4 + 2.56 + …

A) 249.96 B) 166.7 C) 164.96 D) 250 E) $\frac{500}{3}$

14. Solve this equation for $x$: $13e^{4x} = 65$

A) $\frac{2}{5}$ B) $\frac{\ln 52}{4}$ C) $\frac{\ln 5}{4}$ D) $\frac{5}{4e}$ E) none of these

15. Solve this equation for $x$: $\ln(4x + 5) = 7$

A) 273 B) $\frac{e^7 - \ln 5}{4}$ C) $\frac{e^2}{4}$ D) $\frac{e^7 - 5}{4}$ E) none of these

16. Solve this equation for $x$: $\sqrt{2x+5} - 1 = x - 6$

A) $x$ =2, 10 B) $x = 2$ C) $x = 10$ D) $x = 7 \pm \sqrt{17}$ E) none of these

17. The graph of $f(x) = \frac{-2}{x+3}$ is obtained from the graph of $y = \frac{1}{x}$ by:

A) Shifting left 2 units and down 3 units.
B) Shifting right 3 units and down 2 units.
C) Reflecting across the $x$-axis, shifting left 3 units and stretching vertically by a factor of 2.
D) Reflecting across the $x$-axis, shifting right 3 units and stretching vertically by a factor of 2.
E) Reflecting across the $y$-axis, shifting left 2 units and stretching vertically by a factor of 3.

18. For the function $f(x) = 5x^2 - 6x$, calculate and simplify $\frac{f(x+h) - f(x)}{h}$.

A) $10x - 6$
B) $0$
C) $5h - 6$
D) $10x + 5h - 6$
E) $1$

19. Use the graph to solve f(x) < g(x):

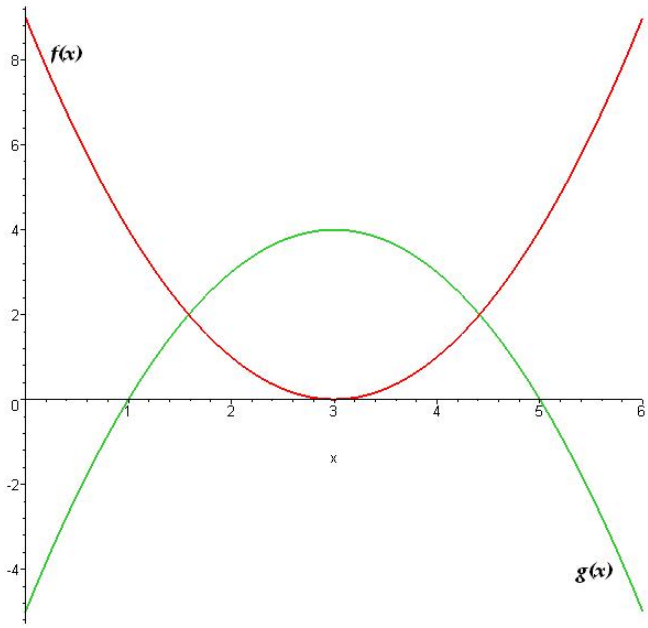
A) $[3-\sqrt{2}, 3+\sqrt{2}]$

B) $(-\infty, 3-\sqrt{2}) \cup (3+\sqrt{2}, \infty)$

C) $(0, 4)$

D) $\{3-\sqrt{2}, 3+\sqrt{2}\}$

E) $(3-\sqrt{2}, 3+\sqrt{2})$




20. When the following system is solved, what is the *x*-coordinate of the solution?

$$4x - 5y = 7$$
$$3x - 3 = 5y - x + 7$$

A) 0 B) –1.5 C) 1.5 D) There is no solution. E) Any real number.

ANSWERS:

1. B
2. C
3. E
4. A
5. D
6. D
7. D
8. B
9. A
10. C
11. B
12. B
13. E
14. C
15. D
16. C
17. C
18. D
19. E
20. D