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GOOD LUCK!

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For grading use:

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| Number Correct | |
| | (out of 20 problems) |

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| Total | |
| | (out of 100 points) |

Name: _____

Multiple Choice Questions

*Show all your work on the page where the question appears.
Clearly mark your answer both on the cover page on this exam
and in the corresponding questions that follow.*

1. Write the given expression without using radicals.

$$\sqrt[11]{x^5}$$

Possibilities:

- (a) x^{-6}
 - (b) $x^{5/11}$
 - (c) x^6
 - (d) $x^5 - x^{11}$
 - (e) $x^{11/5}$
-

2. A rectangle is 6 times as tall as it is wide. Express the area of the rectangle as a function of its width.

Possibilities:

- (a) $A(w) = 6w^2$
 - (b) $A(w) = \sqrt{6w}$
 - (c) $A(w) = \sqrt{\frac{w}{6}}$
 - (d) $A(w) = 6w$
 - (e) $A(w) = \frac{w}{6}$
-

3. Find $f(4)$ if $f(x) = \begin{cases} 9 & \text{if } x \leq 1 \\ 2x + 7 & \text{if } 1 < x \leq 3 \\ 3x + 4 & \text{if } 3 < x \leq 5 \\ 19 & \text{if } x > 5 \end{cases}$

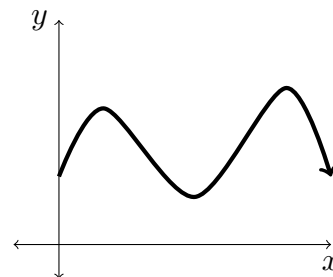
Possibilities:

- (a) 16
- (b) 13
- (c) 19
- (d) 9
- (e) 15

4. Find the domain of $\sqrt{5-x} + \sqrt{6}$

Possibilities:

- (a) $(5, \infty)$
- (b) $(-\infty, 5]$
- (c) $(-\infty, \infty)$
- (d) $[5, \infty)$
- (e) $(-\infty, 5) \cup (6, \infty)$



5. Which situation below is most reasonably depicted in this graph:

Possibilities:

- (a) y is the number of bacteria at time x if the bacteria experience a steady rate of exponential growth.
- (b) y is the temperature of left-over food at time x if the food is placed in the refrigerator at time $x = 0$.
- (c) y is the distance from home at time x as you run to the end of the block and back at a steady pace.
- (d) y is the outside temperature after x hours, if $x = 0$ is the morning of the first day.
- (e) y is the amount of water in a bucket at time x if a hole is made in the bucket at time $x = 0$.

6. A car moves along a straight test track. The distance traveled by the car at various times is shown in the table. Find the average speed of the car from 10 to 25 seconds.

| | | | | | | | |
|-----------------|---|----|-----|-----|-----|------|------|
| Time (seconds) | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
| Distance (feet) | 0 | 50 | 200 | 450 | 800 | 1250 | 1800 |

Possibilities:

- (a) 80 feet per second
- (b) 60 feet per second
- (c) 70 feet per second
- (d) 50 feet per second
- (e) 20 feet per second

7. Simplify the formula for the average rate of change of $f(x) = (x - 2)^2 + 9$ from $x = 6$ to $x = 6 + h$

Possibilities:

- (a) $8 + h$
- (b) $2h$
- (c) h
- (d) 1
- (e) $12 + h$

8. Find the domain of $\left(\frac{f}{g}\right)(x)$ if $f(x) = 2x^2 + 9x + 6$ and $g(x) = 7x - 8$

Possibilities:

- (a) $(-\infty, \infty)$
- (b) $(-\infty, \frac{8}{7}) \cup (\frac{8}{7}, \infty)$
- (c) $[\frac{8}{7}, \infty)$
- (d) $(-\infty, \frac{7}{8})$
- (e) $\left[\frac{-9 \pm \sqrt{9^2 - 4(2)(6)}}{4}, \infty\right)$

9. Find the rule of the function $(f \circ g)(x)$ if $f(x) = \frac{1}{5x+7}$ and $g(x) = x^{17} + 19$

Possibilities:

(a) x

(b) $\frac{7x-5}{19x-17}$

(c) $\frac{1}{5(x^{17}+19)+7}$

(d) $\left(\frac{1}{5x+7}\right)^{17} + 19$

(e) $5\left(\sqrt[17]{x-19}\right) - 7$

10. Find $(f - g)(4)$ where $f(x) = 3x^2 - 6x - 9$ and $g(x) = 2x - 5$

Possibilities:

(a) 12

(b) 25

(c) 2

(d) 18

(e) 0

11. A certain fungus grows in a circular shape. Its diameter in inches after t weeks is given below.

$$9 - 5e^{-3t}$$

Which of the following is an expression for the area covered as a function of time?

Possibilities:

(a) $A(t) = \pi 81 - 25e^{-9t}$

(b) $D(t) = 9 - 5e^{-3t}$

(c) $A(t) = \pi t^2$

(d) $t = \ln(5/9)/3$

(e) $A(t) = \pi \left(\frac{9 - 5e^{-3t}}{2} \right)^2$

12. Suppose that the graph of $y = f(x)$ contains the point $(9, 5)$. Which of these points must be on the graph of $y = g(x)$ for $g(x) = 3 + 4f(x + 8)$?

Possibilities:

(a) $(6, 17)$

(b) $\left(17, \frac{1}{2} \right)$

(c) $\left(\frac{1}{4}, 8 \right)$

(d) $(1, 23)$

(e) $(12, 2)$

-
13. Which sequence of transformations will transform the graph of the function f into the graph of the function g ?

$$f(x) = \sqrt{x} + 5 \quad g(x) = \sqrt{x-3} + 6$$

Possibilities:

- (a) shift left by 3 then shift down by 1
- (b) shift left by 3 then shift up by 1
- (c) shift right by 3 then shift down by 1
- (d) shift left by 1 then shift down by 3
- (e) shift right by 3 then shift up by 1

-
14. Use algebra to find the inverse of the given one-to-one function.

$$f(x) = (x^6 + 4)^5$$

Possibilities:

- (a) $f^{-1}(x) = x^{30} + 4$
- (b) $f^{-1}(x) = \sqrt[6]{\sqrt[4]{x} - 5}$
- (c) $f^{-1}(x) = \sqrt[5]{\sqrt[6]{x} - 4}$
- (d) $f^{-1}(x) = (x^5 + 4)^6$
- (e) $f^{-1}(x) = \sqrt[6]{\sqrt[5]{x} - 4}$

15. Use algebra to find the inverse of the given one-to-one function. $f(x) = \frac{9x}{5x + 3}$

Possibilities:

(a) $f^{-1}(x) = \frac{5x + 3}{9x}$

(b) $f^{-1}(x) = \frac{9x}{5x - 3}$

(c) $f^{-1}(x) = \frac{9}{5}x + 3$

(d) $f^{-1}(x) = \frac{3x}{9 - 5x}$

(e) $f^{-1}(x) = \frac{3x}{9x + 5}$

16. A weekly census of the tree-frog population in Frog Hollow State Park produces the following results.

| | | | | | | |
|--------|----|-----|-----|------|------|-------|
| Week: | 1 | 2 | 3 | 4 | 5 | 6 |
| Frogs: | 60 | 180 | 540 | 1620 | 4860 | 14580 |

Which exponential growth model most closely matches the observations, if t is the week number?

Possibilities:

(a) $3(60^{(t/7)})$

(b) $3(60^t)$

(c) $20(3^t)$

(d) $20(9^{(t/7)})$

(e) $60(9^t)$

-
17. Determine how much money will be in a savings account if the initial deposit was \$120 and the interest rate is 3.93% compounded continuously for 2 years, 5 months. (Round your answer to the nearest cent.)

Possibilities:

- (a) \$131.72
- (b) \$131.96
- (c) \$132.20
- (d) \$132.44
- (e) \$132.68

-
18. Translate the given logarithmic statement into an equivalent exponential one.

$$\log_9(5x + 3) = 14$$

Possibilities:

- (a) $(5x + 3)^{14} = 9$
- (b) $(5x + 3)^9 = 14$
- (c) $(9)^{5x+3} = 14$
- (d) $(9)^{14} = 5x + 3$
- (e) $(14)^{5x+3} = 9$

19. Write the domain of the function $h(x) = \log(x - 17)$ in interval notation.

Possibilities:

- (a) $(-\infty, 17]$
- (b) $(-\infty, 17) \cup (17, \infty)$
- (c) $(-\infty, -17)$
- (d) $(-\infty, \infty)$
- (e) $(17, \infty)$

20. Write the given expression as a single logarithm.

$$9 \log(x) + \log(5y) - \log(3z)$$

Possibilities:

- (a) $\log\left(\frac{x^9 y^5}{z^3}\right)$
- (b) $\log(x^9 y^5 z^3)$
- (c) $\log\left(\frac{x^9(5y)}{3z}\right)$
- (d) $\log(9x + 5y - 3z)$
- (e) $\log(9x(5 + y) - 3 - z)$

Formula Sheet:

Compound Interest: If a principal P_0 is invested at an interest rate r for a period of t years, then the amount $P(t)$ of the investment is given by:

$$P(t) = P_0 \left(1 + \frac{r}{n}\right)^{nt} \quad (\text{if compounded } n \text{ times per year})$$

$$P(t) = P_0 e^{rt} \quad (\text{if compounded continuously}).$$

Change of Base Formula: Let a and b be two positive numbers with $a, b \neq 1$. If $x > 0$, then:

$$\log_a(x) = \frac{\log_b(x)}{\log_b(a)}$$

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