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a b c d e

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GOOD LUCK!

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| 3. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e | 12. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
| 4. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e | 13. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
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| 9. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e | 18. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
| 10. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e | 19. <input type="radio"/> a <input type="radio"/> b <input type="radio"/> c <input type="radio"/> d <input type="radio"/> e |
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For grading use:

| | |
|--------------------------------|--------------------|
| Multiple Choice | Short Answer |
| (number right) (5 points each) | (out of 10 points) |

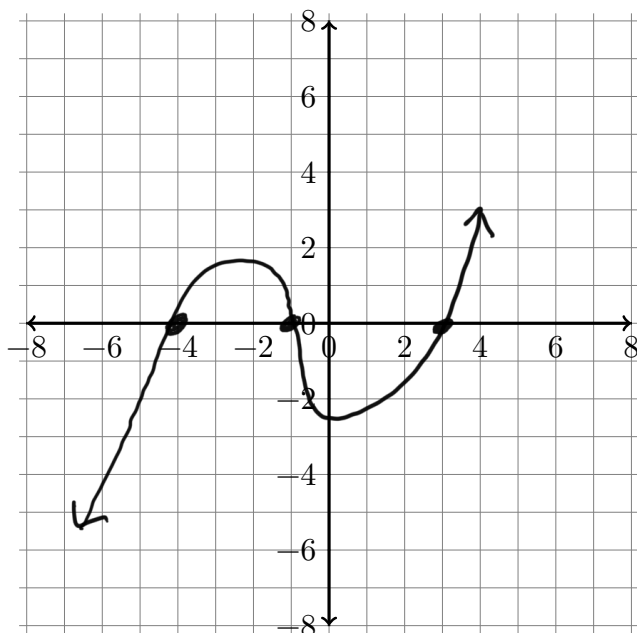
| | |
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| Total | |
| | (out of 100 points) |

Short Answer Questions

Each question is an opportunity to earn 5 points. Points are earned on the clarity and correctness of your explanation, not merely on having a correct answer somewhere.

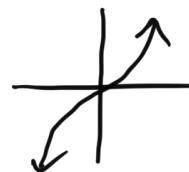
1. Sketch a graph of the given function. Be sure that it is clear where your x-intercepts are located, and show proper multiplicities, degree, and end behavior.

$$f(x) = \frac{1}{5}(x+4)(x+1)(x-3)$$



Roots at $x = -4, x = -1, x = 3$
Degree 3, positive coefficient

\Rightarrow same e.b. as
 $y = x^3$



2. Find a formula for the inverse of the function $f(x) = \sqrt{7+4x}$ and state the domain of $f^{-1}(x)$.

$$\begin{aligned} y &= \sqrt{7+4x} \\ x &= \sqrt{7+4y} \\ x^2 &= \sqrt{7+4y}^2 \\ x^2 &= 7+4y \\ x^2 - 7 &= 4y \\ y &= \frac{x^2 - 7}{4} \end{aligned}$$

so $f^{-1}(x) = \frac{x^2 - 7}{4}$.

Domain of f^{-1} = range of f .

Since $f(x) = \sqrt{7+4x}$,
the range of $f(x)$ is $[0, \infty)$.

So the domain of $f^{-1}(x)$ is
 $[0, \infty)$.

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.*

3. What is the leading term of $444 + 6x^{22} + 9x^7 + 88x^5 + 3x$?

Possibilities:

- (a) $6x^{22}$
 - (b) 444
 - (c) $3x$
 - (d) $9x^7$
 - (e) $88x^5$
-

4. Which of the following best describes the end behavior of $f(x) = -9x^{88} + 7x^6$?

Possibilities:

- (a) $y \rightarrow 0$ as $x \rightarrow -\infty$ and $y \rightarrow 0$ as $x \rightarrow \infty$
 - (b) $y \rightarrow -\infty$ as $x \rightarrow -\infty$ and $y \rightarrow \infty$ as $x \rightarrow \infty$
 - (c) $y \rightarrow -\infty$ as $x \rightarrow -\infty$ and $y \rightarrow -\infty$ as $x \rightarrow \infty$
 - (d) $y \rightarrow \infty$ as $x \rightarrow -\infty$ and $y \rightarrow \infty$ as $x \rightarrow \infty$
 - (e) $y \rightarrow \infty$ as $x \rightarrow -\infty$ and $y \rightarrow -\infty$ as $x \rightarrow \infty$
-

5. Suppose a polynomial has $x = \frac{13}{11}$ as a root. Which of these must be a factor of the polynomial?

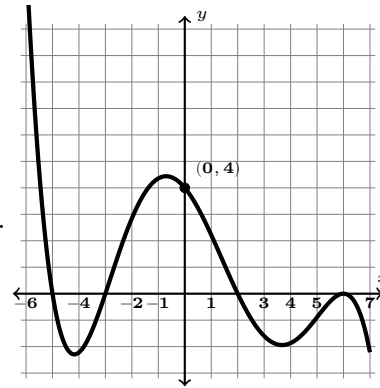
Possibilities:

- (a) $(x + 2)$
 - (b) $(\frac{13}{11}x)$
 - (c) $(13x - 11)$
 - (d) $(x - 2)$
 - (e) $(11x - 13)$
-

-
6. Let $f(x)$ be the polynomial whose graph is given below. All of the roots of the polynomial are shown. What can be said about the leading coefficient and degree of the polynomial?

Possibilities:

- (a) The leading coefficient is zero, the degree is negative.
- (b) The leading coefficient is positive, the degree is even.
- (c) The leading coefficient is negative, the degree is even.
- (d) The leading coefficient is negative, the degree is odd.
- (e) The leading coefficient is positive, the degree is odd.



-
7. Refer to the graph from problem 6. Which of these cannot be factors of the polynomial in the graph?

Possibilities:

- (a) $(x - 2)$
- (b) $(x - 4)$
- (c) $(x + 3)$
- (d) $(x + 5)$
- (e) $(x - 6)$

-
8. Refer to the graph from problem 6. Which root of the polynomial has even multiplicity?

Possibilities:

- (a) $x = 2$
- (b) $x = -5$
- (c) $x = 6$
- (d) $x = -3$
- (e) $x = 4$

9. Let

$$s(x) = \frac{8x - 120}{5x^2 - 25x + 20}$$

The graph of $y = s(x)$ has an x -intercept at:

Possibilities:

- (a) $x = 6$
 - (b) $x = \frac{8}{5}$
 - (c) $x = 4$
 - (d) $x = 0$
 - (e) $x = 15$
-

10. Let

$$s(x) = \frac{8x - 120}{5x^2 - 25x + 20}$$

The graph of $y = s(x)$ has vertical asymptotes at:

Possibilities:

- (a) $x = 15$ only
 - (b) $x = 0$ only
 - (c) $x = 1$, $x = 4$, and $x = 15$
 - (d) $x = 1$ only
 - (e) $x = 1$ and $x = 4$
-

11. Let

$$s(x) = \frac{8x - 120}{5x^2 - 25x + 20}$$

The graph of $y = s(x)$ has a horizontal asymptote at:

Possibilities:

- (a) $y = 15$
 - (b) $y = 6$
 - (c) $y = 0$
 - (d) $y = 4$
 - (e) $y = \frac{8}{5}$
-

12. Which of the following is most reasonable as the equation of the following graph:

Possibilities:

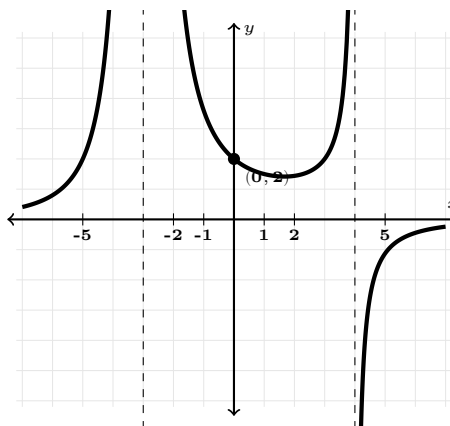
(a) $f(x) = \frac{-72}{(x+3)^2(x-4)}$

(b) $f(x) = \frac{1}{(x+3)(x-4)^2}$

(c) $f(x) = \frac{72}{(x-3)^2(x+4)}$

(d) $f(x) = \frac{-96}{(x-3)(x+4)^2}$

(e) $f(x) = \frac{2}{(x+3)^2(x+4)}$



13. Find all real distinct solutions x to $\sqrt{x-6} + 4 = 8$

Possibilities:

(a) $x = 8$ only

(b) $x = 22$ only

(c) $x = 54$ only

(d) $x = 64$ and $x = -64$

(e) $x = 64$ only

14. Let $f(x)$ be a one-to-one function such that $f(8) = 16$. What is $f^{-1}(16)$?

Possibilities:

(a) $f^{-1}(16) = \frac{1}{16}$

(b) $f^{-1}(16) = 8$

(c) $f^{-1}(16) = 128$

(d) $f^{-1}(16) = 16$

(e) $f^{-1}(16) = 0$

15. Let $f(x)$ be a one-to-one function with domain $[-3, 39)$. What is the range of $f^{-1}(x)$?

Possibilities:

(a) $(-\infty, \infty)$

(b) $(-\infty, -3) \cup [39, \infty)$

(c) $[3, 39)$

(d) $[-3, 39)$

(e) $(-39, -3]$

16. Let $f(x) = \sqrt[5]{2x+8} + 7$. What is the formula for $f^{-1}(x)$?

Possibilities:

(a) $f^{-1}(x) = \sqrt[5]{2x+15}$

(b) $f^{-1}(x) = \frac{x-49575}{2}$

(c) $f^{-1}(x) = \frac{(x-7)^5 - 8}{2}$

(d) $f^{-1}(x) = \frac{(x-8)^5 - 7}{2}$

(e) $f^{-1}(x) = \frac{7 \pm \sqrt[5]{x-8}}{2}$

17. Let $f(x) = \frac{8x}{9x+7}$. What is the formula for $f^{-1}(x)$?

Possibilities:

(a) $f^{-1}(x) = \frac{7x}{8-9x}$

(b) $f^{-1}(x) = \frac{7x}{9x+8}$

(c) $f^{-1}(x) = \frac{8x}{9x-7}$

(d) $f^{-1}(x) = \frac{9x+7}{8x}$

(e) $f^{-1}(x) = \frac{8}{9}x + 7$

18. Find a value $b > 0$ so that the graph of the exponential function $f(x) = b^x$ contains the point $(3, \frac{1}{216})$.

Possibilities:

(a) $b = \sqrt{3}$

(b) $b = 6$

(c) $b = 3$

(d) $b = \frac{1}{6}$

(e) $b = 1$

19. Find an exponential function that satisfies $f(0) = 7$ and $f(1) = 77$.

Possibilities:

(a) $f(x) = 7 \cdot 77^x$

(b) $f(x) = 77 \cdot 7^x$

(c) $f(x) = 11 \cdot 7^x$

(d) $f(x) = 7 \cdot 11^x$

(e) $f(x) = 70^x$

20. 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: | 50 | 100 | 200 | 400 | 800 | 1600 |

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

Possibilities:

(a) $50(4^t)$

(b) $25(2^t)$

(c) $25(4^{(t/7)})$

(d) $2(50^{(t/7)})$

(e) $2(50^t)$

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| Right | Grade | Wrong |
|-------|-------|-------|
| 18 | 90 | 0 |
| 17 | 85 | 1 |
| 16 | 80 | 2 |
| 15 | 75 | 3 |
| 14 | 70 | 4 |
| 13 | 65 | 5 |
| 12 | 60 | 6 |
| 11 | 55 | 7 |
| 10 | 50 | 8 |
| 9 | 45 | 9 |
| 8 | 40 | 10 |
| 7 | 35 | 11 |
| 6 | 30 | 12 |
| 5 | 25 | 13 |
| 4 | 20 | 14 |
| 3 | 15 | 15 |
| 2 | 10 | 16 |
| 1 | 5 | 17 |
| 0 | 0 | 18 |

GOOD LUCK!

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20. a b c d e

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