

UT Math Placement Assessment Warmup Assessment KEY

Full name: _____ EID: _____

Orientation: _____ Date: _____

Exam information and directions

- **DO NOT BEGIN YOUR EXAM UNTIL YOU ARE TOLD TO DO SO BY THE EXAM PROCTOR.**
- You will have seventy-five (75) minutes to complete this exam.
- There are 30 multiple questions on this exam.
- Calculators are NOT allowed on this exam.
- Use a #2 pencil with eraser for this exam. If you are feeling lucky, you may use either a pen with black or dark ink of any color except red.
- For multiple choice questions, **you must write your answer choice in the provided blank** to receive credit. On the real exam, you'll bubble the answer into the scantron.
- Good luck!

1. _____ How many solutions does

$$\frac{12}{x(x+8)} = 0$$

have? A. 0 B. 1 C. 2 D. more than 2

Solution: A - there does not exist any number you can divide 12 by to get 0.

2. _____ Solve for
- a
- :

$$3(b - 2a) - 6(4a + 3b) = 7.$$

- A. $a = -\frac{b}{2} - \frac{7}{30}$
 B. $a = -\frac{5b}{6} - \frac{7}{18}$
 C. $a = \frac{7b}{10} - \frac{7}{30}$
 D. $a = -\frac{7b}{6} + \frac{7}{18}$

Solution: A - rearrange and you'll get this.

3. _____ For what value(s) of
- x
- is

$$(x - 1)(x + 2)(x - 3)^2(x - 4)^5$$

positive?

- A. $-2 < x < 1$ and $x > 4$
 B. $-2 < x < 1$ and $x > 3$
 C. $x < -2$ and $1 < x < 3$
 D. $x < -2$ and $1 < x < 4$

Solution: A - the degree of this polynomial is 9, and since it's overall positive, we begin at the left of the graph from $-\infty$. Then we cross or bounce back from the roots depending on whether the multiplicity of the term $(x - \text{root})$ is odd or even, respectively. Alternatively, plug in numbers between each root and see whether the entire equation evaluates to positive or negative, and then make your decision.

4. _____ Which of the expressions below is equivalent to

$$\frac{a^{-2}b^3}{c^8d^{-4}}$$

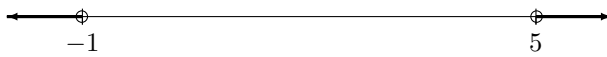
assuming that $a, b, c,$ and d are all positive?

- A. $a^{-2}b^3c^{-8}d^{-4}$
 B. $\frac{d^4}{a^{-2}b^{-3}c^{-8}}$
 C. $\frac{a^{-2}c^{-8}d^4}{b^{-3}}$

D. $\frac{c^{-8}d^4}{a^{-2}b^{-3}}$

Solution: C - changing the variable from numerator to denominator will change the sign of the exponent.

5. _____ The set of points



is represented by which of the following inequalities?

- A. $|x - 2| > 3$
 B. $|x| > 3$
 C. $|x - 2| < 3$
 D. $|x| < 5$

Solution: A

6. _____ Which of the following forms arises after rewriting

$$x^2 + 10x + 19$$

by completing the square? Assume $a > 0$.

- A. $(x + a)^2 + 19$
 B. $(x + a)^2 - 6$
 C. $(x - 5)^2 + a$
 D. $(x + 10)^2 - a$

Solution: B -

$$(x^2 + 10x + 25) - 6 = (x + 5)^2 - 6$$

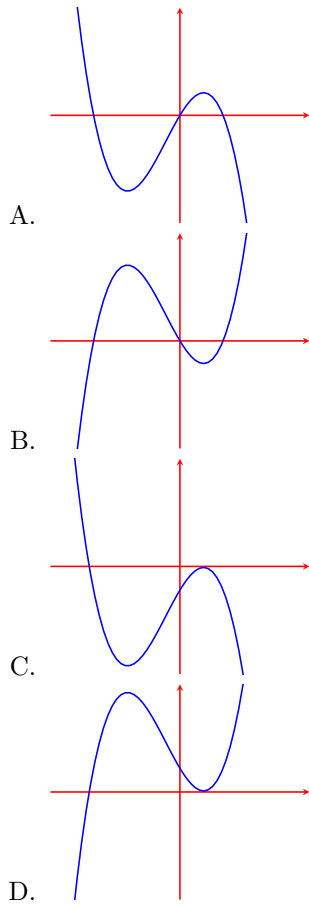
7. _____ Factor the expression $3x^2 - 10x - 8$ into a product of two linear terms with integer coefficients.

- A. $(3x + 4)(x - 2)$
 B. $(3x - 4)(x + 2)$
 C. $(3x - 2)(x + 4)$
 D. $(3x + 2)(x - 4)$

Solution: D -

$$3x^2 - 12x + 2x - 8 = 3x(x - 4) + 2(x - 4) = (3x + 2)(x - 4)$$

8. _____ Graph the function $y = 2x - x^2 - x^3$.



Solution: A

9. _____ At how many x -values does

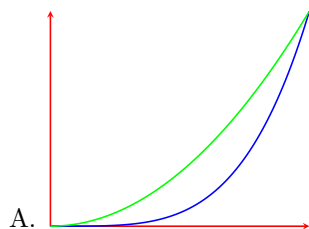
$$y = (x + 5)^2(x + 11)(x - 7)^3$$

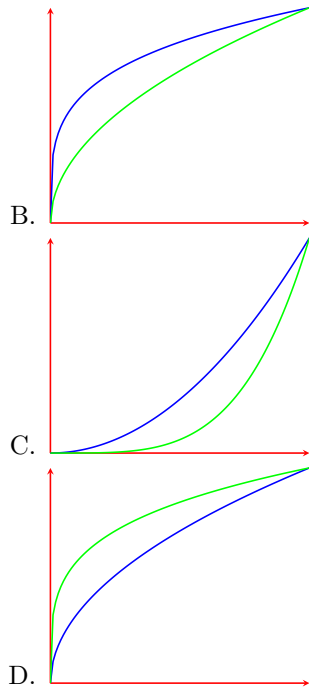
touch, but not cross, the x -axis?

- A. more than two
- B. none
- C. two
- D. one

Solution: D - only one term has an even multiplicity, so the graph only "bounces" at this root.

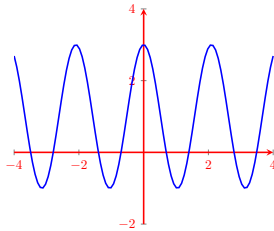
10. _____ Which of the following shows the graphs of $y = x^{1/2}$ (darker blue) and $y = x^{1/4}$ (lighter green) on the interval $[0, 1]$?



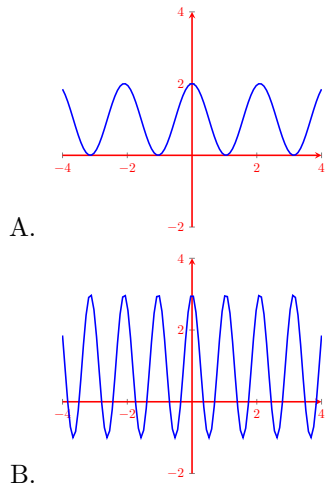


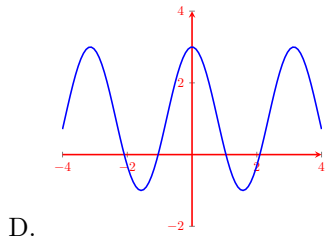
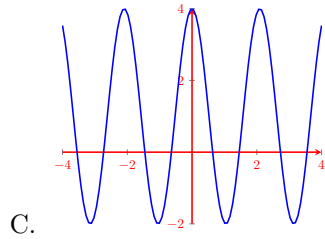
Solution: D

11. _____ Suppose that the graph of $y = f(x)$ is



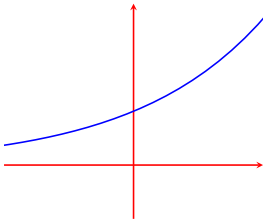
What is the graph of $y = f(2x)$?





Solution: B

12. _____ Suppose that the graph of $y = f(x)$ is



This function has an inverse because its graph...

- A. is above the x -axis.
- B. passes the vertical line test.
- C. passes the horizontal line test.
- D. has no x -intercept.

Solution: C

13. _____ Suppose that $f(x) = x^2 + 1$ and $g(x) = 2x - 3$. What is $f(g(7))$?
- A. 97
 - B. 122
 - C. 144
 - D. 94

Solution: B

14. _____ What is the domain of

$$f(x) = \frac{\sqrt{x+1}}{\sqrt{7-x}}?$$

- A. $-1 \leq x < 7$
- B. $-7 < x \leq 1$
- C. $x < 7$
- D. $x \geq -1$

Solution: A

15. _____ What is the range of

$$y = \frac{x}{1+x}?$$

- A. $y \neq 1$
- B. $0 < y < 1$
- C. $y \neq 0$
- D. $y > 1$

Solution: A

16. _____ What feature does the graph of

$$y = \frac{x(x+2)}{(x-1)(x+2)}$$

have at $x = 1$?

- A. vertical asymptote
- B. horizontal asymptote
- C. x-intercept
- D. hole

Solution: A - because of the $(x - 1)$ term in the denominator.

17. _____ What feature does the graph of

$$y = \frac{x(x+2)}{(x-1)(x+2)}$$

have at $x = -2$?

- A. hole
- B. vertical asymptote
- C. x-intercept
- D. horizontal asymptote

Solution: A - because of the $(x + 2)$ term in both the numerator and the denominator.

18. _____ How many x -intercepts does

$$y = \frac{(x - 5)(x + 7)(x - 6)}{(x + 2)(x - 6)(x + 3)}$$

have?

- A. three
- B. two
- C. none
- D. one

Solution: B - both $(x - 5)$ and $(x + 7)$ terms establish x -intercepts. $(x - 6)$ is present in both top and bottom so it forms a hole instead.

19. _____ How many solutions does

$$x^{3/2} = x^{5/2}$$

have?

- A. three
- B. none
- C. one
- D. two

Solution: D - $x = 0, 1$

20. _____ Find all solutions of the equation

$$x - \sqrt{x} = 12.$$

- A. 9
- B. ± 9 and ± 16
- C. 16
- D. 9 and 16

Solution: C

21. _____ Evaluate $\tan(\pi/3)$.

- A. $\sqrt{3}$
- B. 1
- C. $1/2$
- D. $\sqrt{3}/2$

Solution: A

22. _____ Evaluate $\arcsin(1/2)$.

- A. $\pi/6$
- B. $\pi/3$
- C. $-\pi/3$
- D. $-\pi/6$

Solution: A

23. _____ Find all solutions of

$$\sin(x) = \cos(x)$$

in the interval $[-\pi, \pi]$.

- A. $\pi/4$
- B. $\pm\pi/4$
- C. none
- D. $\pi/4, -3\pi/4$

Solution: D

24. _____ Find all solutions of

$$\sin(x) = \sec(x).$$

- A. $n\pi + \pi/2$ for all integers n
- B. $n\pi$ for all integers n
- C. $n\pi + \pi/4$ for all integers n
- D. none

Solution: D

25. _____ Which of the following is equivalent to

$$2 \cos^2(x) - \cos(2x)?$$

- A. 1
- B. 2
- C. $\sin^2(x)$
- D. $\sin(2x)$

Solution: A -

$$\cos(2x) = 2 \cos^2(x) - 1 = 2 \cos^2(x) - (2 \cos^2(x) - 1) = 1$$

26. _____ The graph of

$$y = 3e^{4x}$$

crosses the y -axis at which of the following values?

- A. $1/4$
- B. $1/3$
- C. 4
- D. 3

Solution: D

27. _____ The expression

$$(3^a)^7$$

is equivalent to which of the following?

- A. 3^{a+7}
- B. 3^{7a}
- C. $3^{(a^7)}$
- D. none of the other choices

Solution: B

28. _____ How many solutions does

$$2^x = 3^x$$

have?

- A. one
- B. more than two
- C. two
- D. none

Solution: A -

$$x = 0 \implies 2^0 = 3^0 = 1$$

29. _____ The expression

$$\ln(ab^7)$$

is equivalent to which of the following? (Assume $a, b > 0$.)

- A. $\ln(a) + 7 \ln(b)$
- B. $7 \ln(a) \ln(b)$

- C. $\ln(a) + \ln(7) + \ln(b)$
D. none of the other choices

Solution: A

30. _____ Solve

$$\log_5(x^2 - 3) = 0.$$

- A. $\pm\sqrt{8}$
B. $\pm\sqrt{3}$
C. ± 2
D. none of the other choices

Solution: C -

$$\begin{aligned}5^0 &= x^2 - 3 \\ \implies 1 &= x^2 - 3 \\ \implies x^2 &= 4 \implies x = \pm 2\end{aligned}$$