

Instructions

- Complete the problems as if this were an actual test.
 - 50-60 minutes of uninterrupted time. (this means no phones, Netflix, snapchat, etc....I promise you will survive 😊)
 - No help from notes, friends, google, etc.
- After you have completed the problems, grade your test using the key provided.
- Try extra problems similar to the ones you missed until you feel like you understand those concepts.

Secondary Math III
Unit 8 PRACTICE EXAM

Name: _____
Period: _____

Multiple Choice. Choose the best answer. There is only one correct answer for each problem.

+2 for each MC: (1 pt for showing legitimate work; 1 pt for correct answer)

- Describe the transformation from $f(x) = \sqrt[3]{x}$ to $g(x) = \sqrt[3]{3x}$
 - a vertical stretch
 - a vertical compression/shrink
 - a horizontal stretch
 - a horizontal compression/shrink
- Which is the result of simplifying $\sqrt{18x^2y^5}$? Assume all variables to be positive.
 - $2xy^2\sqrt{3y}$
 - $2xy\sqrt{3y^3}$
 - $3xy^2\sqrt{2y}$
 - $3x^2y^5\sqrt{2}$
- The time it takes a pendulum to complete one full swing is given by the radical function $T = 2\pi\sqrt{\frac{L}{9.8}}$, where T is the time in seconds and L is the length of the pendulum in meters. To the nearest tenth of a second, how long does it take for the pendulum to complete one full swing if its length is 1.2 meters?
 - 0.4 seconds
 - 0.7 seconds
 - 1.2 seconds
 - 2.2 seconds
- Which of the following is $xy^{3/2}$ written in radical terms?
 - $x\sqrt{y^3}$
 - $\sqrt{xy^3}$
 - $x^3\sqrt{y^2}$
 - $\sqrt[3]{xy^2}$
- If $f(x) = \sqrt{x+3}$ and $g(x) = x^2$, find $(f \circ g)(3)$
 - 6
 - 9
 - $2\sqrt{3}$
 - $4\sqrt{3}$
- If $f(x)$ and $g(x)$ are inverses then $f(g(x)) =$
 - $-x$
 - x
 - 0
 - 1

Free Response. Show all work! You will not receive any credit if there is no work to support your answers.

Given $f(x) = x^2 + x$ and $g(x) = 2x - 1$, perform the indicated operation and simplify when possible. State the Domain on 7 and 8. (+2 for each)

7. $(f - g)(x)$ D : _____

8. $(g \circ f)(x)$ D : _____

9. $(f \cdot g)(2)$

10. $(g \circ f)(-2)$

11. Given $f(x) = (x - 2)^2$.

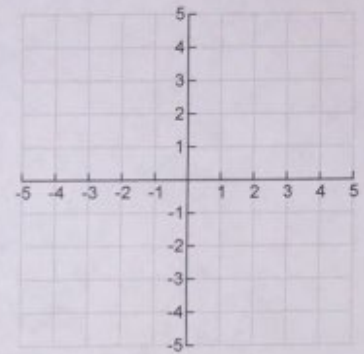
a. Graph $f(x)$. (+2)

b. Restrict the domain of $f(x)$ so it is a one-to-one function. (+1)

Domain: _____

c. Find $f^{-1}(x)$. (+2)

Then graph $f^{-1}(x)$ on the same coordinate system as $f(x)$.



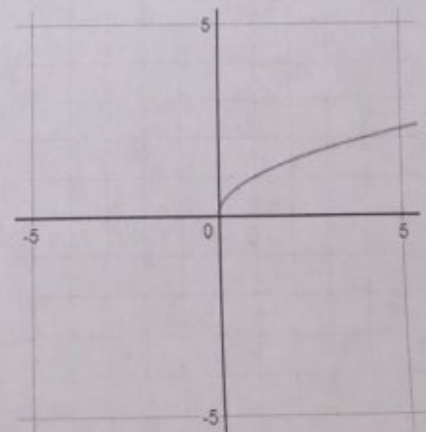
$f^{-1}(x) =$ _____

The graph of the square root function, $f(x) = \sqrt{x}$, is shown below..

Sketch the graph obtained by the following changes, and then write an equation for the new function $g(x)$. (+3; 2 pts equation; 1 pt graph)

12. Vertical stretch by a factor of 2; shift left 3

$g(x) =$ _____



13. Find the inverse function of $f(x) = \frac{5x-2}{2}$. (+3)

$$f^{-1}(x) = \underline{\hspace{4cm}}$$

Simplify. Rationalize any denominators. Assume all variables to be positive. (+3 each)

14. $(x^3 y^5)^{-3}$

15. $5\sqrt[3]{16} - \sqrt[3]{54}$

16. $\frac{4}{\sqrt{2}}$

17. $\sqrt{3} \cdot \sqrt{15}$

Solve. Check your answers. (+3 each)

18. $\sqrt[3]{x-7} + 8 = 10$

19. $\sqrt{x+5} = x+3$

Multiple Choice. Choose the best answer. There is only one correct answer for each problem.

+2 for each: (1 pt for showing legitimate work; 1 pt for correct answer)

- +2** 1. Describe the transformation from $f(x) = \sqrt[3]{x}$ to $g(x) = \sqrt[3]{3x}$
- A** a. a vertical stretch
b. a vertical compression/shrink
c. a horizontal stretch
D d. a horizontal compression/shrink

only circle one!

vertical stretch if $\sqrt[3]{3} \cdot \sqrt{x}$ (before \sqrt{x})
horizontal compression if $\sqrt[3]{3x}$ (before x but in $\sqrt{\quad}$)

- +2** 2. Which is the result of simplifying $\sqrt{18x^2y^5}$? Assume all variables to be positive.
- C** a. $2xy^2\sqrt{3y}$
b. $2xy\sqrt{3y^3}$
c. $3xy^2\sqrt{2y}$
d. $3x^2y^5\sqrt{2}$

$$\sqrt{9} \sqrt{2} \sqrt{x^2} \sqrt{y^4} \sqrt{y} \rightarrow 3xy^2\sqrt{2y}$$

- +2** 3. The time it takes a pendulum to complete one full swing is given by the radical function $T = 2\pi\sqrt{\frac{L}{9.8}}$, where T is the time in seconds and L is the length of the pendulum in meters. To the nearest tenth of a second, how long does it take for the pendulum to complete one full swing if its length is 1.2 meters?
- D** a. 0.4 seconds
b. 0.7 seconds
c. 1.2 seconds
d. 2.2 seconds

$$T = 2\pi\sqrt{\frac{1.2}{9.8}} \rightarrow T = 2.19$$

- +2** 4. Which of the following is $xy^{3/2}$ written in radical terms?
- A** a. $x\sqrt{y^3}$
b. $\sqrt{xy^3}$
c. $x^3\sqrt{y^2}$
d. $\sqrt[3]{xy^2}$

$x\sqrt{y^3}$ only the y is affected by the power $3/2$
it's like saying $x \cdot y^{3/2}$

- +2** 5. If $f(x) = \sqrt{x+3}$ and $g(x) = x^2$, find $(f \circ g)(3)$
- C** a. 6
b. 9
c. $2\sqrt{3}$
d. $4\sqrt{3}$

$$f(g(3)) \rightarrow g(3) = (3)^2 = 9$$

$$f(9) = \sqrt{9+3} = \sqrt{12} = \sqrt{4 \cdot 3} = 2\sqrt{3}$$

- +2** 6. If $f(x)$ and $g(x)$ are inverses then $f(g(x)) =$
- B** a. $-x$
b. x
c. 0
d. 1

Free Response. Show all work! You will not receive any credit if there is no work to support your answers.

Given $f(x) = x^2 + x$ and $g(x) = 2x - 1$, perform the indicated operation and simplify when possible. State the Domain on 7 and 8.

7. $(f-g)(x)$ D: $\boxed{\mathbb{R}}$ (+1) b/c no restrictions

$$f(x) - g(x)$$

$$(x^2 + x) - (2x - 1)$$

$$\boxed{x^2 - x + 1}$$
 (+1)

8. $(g \circ f)(x)$ D: $\boxed{\mathbb{R}}$ (+1)

$$g(f(x))$$

$$g(x^2 + x) = 2(x^2 + x) - 1$$

$$= \boxed{2x^2 + 2x - 1}$$
 (+1)

9. $(f \cdot g)(2)$

$$f(2) \cdot g(2)$$

$$(4 + 2)(4 - 1)$$

$$(6)(3) = \boxed{18}$$
 (+2)

part of points come from showing work!

10. $(g \circ f)(-2)$

$$g(f(-2)) \rightarrow f(-2) = (-2)^2 + (-2)$$

$$4 - 2 = 2$$

$$g(2) = (2)(2) - 1$$

$$4 - 1 = \boxed{3}$$
 (+2)

11. Given $f(x) = (x-2)^2$.

- Graph $f(x)$.
- Restrict the domain of $f(x)$ so it is a one-to-one function.

Domain: $\boxed{x \geq 2}$ (+1)

c. Find $f^{-1}(x)$.

Then graph $f^{-1}(x)$ on the same coordinate system as $f(x)$.

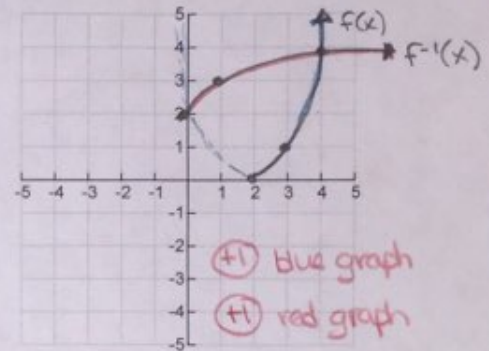
$$f(x) = (x-2)^2$$

$$x = (y-2)^2$$
 switch $x \leftrightarrow y$ (+1) switch $x \leftrightarrow y$

$$\sqrt{x} = y - 2$$
 $\sqrt{\text{both sides}}$

$$\sqrt{x} + 2 = y$$

$$\boxed{f^{-1}(x) = \sqrt{x} + 2}$$
 (+1)



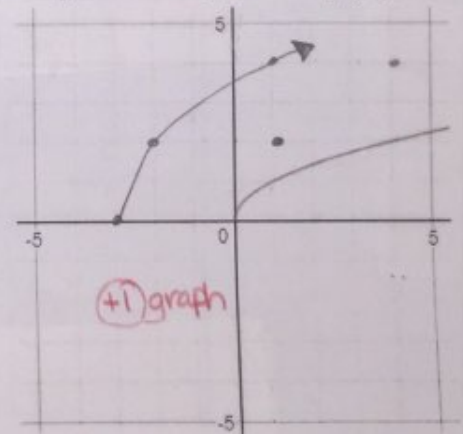
The graph of the square root function, $f(x) = \sqrt{x}$, is shown below..

Sketch the graph obtained by the following changes, and then write an equation for the new function $g(x)$.

12. Vertical stretch by a factor of 2; shift left 3

$$g(x) = \underline{2\sqrt{x+3}}$$

(+1) (+1)
2 in front of $\sqrt{\quad}$ \rightarrow +3 under $\sqrt{\quad}$



13. Find the inverse function of $f(x) = \frac{5x-2}{2}$.

$x = \frac{5y-2}{2}$ switch x & y (+1) Switch x & y

$2x = 5y - 2$ multiply both sides by denominator

$2x + 2 = 5y$ solve for y

$\frac{2x+2}{5} = y$

(+1) Show work

$f^{-1}(x) = \frac{2x+2}{5}$ OR $\frac{2}{5}x + \frac{2}{5}$

OR $\frac{2}{5}x + \frac{2}{5}$

(+1) Answer

Simplify. Rationalize any denominators. Assume all variables to be positive.

14. $(x^3y^5)^{-9}$

$x^{-9}y^{-15} = \frac{1}{x^9y^{15}}$ (+1) x in denominator (+1) y in denominator

(+1) Answer

15. $5\sqrt[3]{16} - \sqrt[3]{54}$

$5\sqrt[3]{8}\sqrt[3]{2} - \sqrt[3]{27}\sqrt[3]{2}$

$5 \cdot 2\sqrt[3]{2} - 3\sqrt[3]{2}$

$10\sqrt[3]{2} - 3\sqrt[3]{2} = 7\sqrt[3]{2}$

(+1) Answer

(+1) Show Work

(+1) Break it down to perfect cubes

16. $\frac{4 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} = \frac{4\sqrt{2}}{2} = 2\sqrt{2}$

(+1) Multiply by $\frac{\sqrt{2}}{\sqrt{2}}$

(+1) Simplified Answer

(+1) Show work!

17. $\sqrt{3} \cdot \sqrt{15} = \sqrt{45}$ (+1) Multiply under radical

$\sqrt{9\sqrt{5}} = 3\sqrt{5}$

(+1) Simplified Answer

(+1) Show work

Solve. Check your answers.

18. $\sqrt[3]{x-7} + 8 = 10$

$\sqrt[3]{x-7} = 2$

ch: $\sqrt[3]{15-7} + 8 = 10$ calc. ✓

$x-7 = (2)^3$ (+1) cube both sides

$x-7 = 8$

$x = 15$ (+1) Answer

(+1) Show the check

19. $(\sqrt{x+5})^2 = (x+3)^2$

$x+5 = x^2+6x+9$

$x^2+5x+4 = 0$

$(x+4)(x+1) = 0$ (+1) Factor

$x = -4$ $x = -1$ (+1) Answer

$\sqrt{-4+5} = (-4)+3$

$\sqrt{-1+5} = (-1)+3$

$\sqrt{1} = -1$

$\sqrt{4} = 2$

$1 \neq -1$

$2 = 2$ ✓

(+1) Show the check for both answers