

36. $f(x) = x^2 + 3$, $g(x) = \sqrt{5+x^2}$

$$(f \circ g)(x) = (\sqrt{5+x^2})^2 + 3 = 5 + x^2 + 3 = x^2 + 8$$

$$(g \circ f)(x) = \sqrt{5 + (x^2 + 3)^2} = \sqrt{5 + x^4 + 6x^2 + 9} = \sqrt{x^4 + 6x^2 + 14}$$

Review : Inverse Functions

For each of the following functions find the inverse of the function. Verify your inverse by computing one or both of the composition as discussed in this section.

Should I write $\frac{x-15}{6}$ as $\frac{1}{6}(x-15)$?

1. $f(x) = 6x + 15$ $x = 6y + 15$
 $\frac{x-15}{6} = f^{-1}(x)$

2. $h(x) = 3 - 29x$ $x = 3 - 29y$ $h^{-1}(x) = \frac{x-3}{-29}$ or $h^{-1}(x) = \frac{1}{29}(3-x)$

3. $R(x) = x^3 + 6$ $x = y^3 + 6$ $R^{-1}(x) = \sqrt[3]{x-6}$

4. $g(x) = 4(x-3)^5 + 21$ $x = 4(y-3)^5 + 21$ $g^{-1}(x) = \sqrt[5]{\frac{x-21}{4}} + 3$

5. $W(x) = \sqrt[5]{9-11x}$ $x = \sqrt[5]{9-11y}$ $W^{-1}(x) = \frac{1}{11}(9-x^5)$ or $W^{-1}(x) = \frac{1}{11}(9-x^5)$

6. $f(x) = \sqrt[7]{5x+8}$ $x = \sqrt[7]{5y+8}$ $f^{-1}(x) = \frac{1}{5}(x^7-8)$

7. $h(x) = \frac{1+9x}{4-x}$ $x = \frac{1+9y}{4-y}$ $4x - xy = 1 + 9y$
 $4x - 1 = 9y + xy$ $h^{-1}(x) = \frac{4x-1}{9+x}$
 $4x - 1 = y(9+x)$

8. $f(x) = \frac{6-10x}{8x+7}$ $x = \frac{6-10y}{8y+7}$ $8xy + 7x = 6 - 10y$
 $8xy + 10y = 6 - 7x$ $f^{-1}(x) = \frac{6-7x}{8x+10}$
 $y(8x+10) = 6 - 7x$

Review : Trig Functions

Determine the exact value of each of the following without using a calculator.

Note that the point of these problems is not really to learn how to find the value of trig functions but instead to get you comfortable with the unit circle since that is a very important skill that will be needed in solving trig equations.

1. $\cos\left(\frac{5\pi}{6}\right) = -\frac{\sqrt{3}}{2}$

$$\frac{1}{2} \div \frac{\sqrt{3}}{2} = \frac{1}{2} \cdot \frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}}$$

$$2. \sin\left(-\frac{4\pi}{3}\right) \quad \frac{\sqrt{3}}{2}$$

$$3. \sin\left(\frac{7\pi}{4}\right) \quad -\frac{\sqrt{2}}{2}$$

$$4. \cos\left(-\frac{2\pi}{3}\right) \quad -\frac{1}{2}$$

$$5. \tan\left(\frac{3\pi}{4}\right) \quad \frac{\sqrt{2}}{2} \cdot \frac{-2}{\sqrt{2}} = -1$$

$$6. \sec\left(-\frac{11\pi}{6}\right) \quad \cos\left(\frac{11\pi}{6}\right) \quad \sec\left(\frac{11\pi}{6}\right) = \frac{2\sqrt{3}}{3}$$

$$7. \cos\left(\frac{8\pi}{3}\right) \quad -\frac{1}{2}$$

$$8. \tan\left(-\frac{\pi}{3}\right) \quad -\frac{\sqrt{3}}{2} \cdot \frac{2}{1} = -\sqrt{3}$$

$$9. \tan\left(\frac{15\pi}{4}\right) \quad -\frac{\sqrt{2}}{\sqrt{2}} = -1$$

$$10. \sin\left(-\frac{11\pi}{3}\right) \quad \frac{\sqrt{3}}{2}$$

$$11. \sec\left(\frac{29\pi}{4}\right) \quad \cos\left(\frac{5\pi}{4}\right) = -\frac{\sqrt{2}}{2} \quad \sec\left(\frac{5\pi}{4}\right) = \frac{-2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{-2\sqrt{2}}{2} = -\sqrt{2}$$

(cos, sin)
 $\left(\frac{a}{b}, \frac{c}{b}\right)$
 $\tan \frac{c}{b} = \frac{c}{b} \div \frac{a}{b} = \frac{c}{b} \cdot \frac{b}{a} = \frac{c}{a}$

Review : Solving Trig Equations

Without using a calculator find the solution(s) to the following equations. If an interval is given then find only those solutions that are in the interval. If no interval is given then find all solutions to the equation.

See extra sheet

1. $4 \sin(3t) = 2$