

Chapter 1: Review of Algebra & Precalculus - Worksheet

1. **Composite functions:** recall that given two functions f and g , the function $f \circ g$ (called f composed with g) is

$$(f \circ g)(x) = f(g(x)).$$

- (a) Given $f(x) = \sqrt{x}$ and $g(x) = (x - 3)^2$, find and simplify the following.

i. $(f \circ g)(x)$ ii. $(g \circ f)(x)$ iii. $(f \circ f \circ f)(x)$

- (b) Let $H(x) = \cos(3x^2) + 1$. Complete the table below to find pairs of functions $f(x)$ and $g(x)$ such that $H(x) = f(g(x))$.

	$f(x) =$	$g(x) =$
i.	$\cos(x) + 1$	
ii.		x^2
iii.		$\cos(3x^2)$
iv.	x	
v.		$\cos(3x^2) + 7$

2. Trigonometry:

- (a) Suppose that $\cos(a) = \frac{2}{5}$ and $\frac{3\pi}{2} < \theta < 2\pi$. Evaluate the following.

i. $\tan(a)$ ii. $\sin(2a)$ iii. $\cos(2a)$

- (b) Evaluate the following.

i. $\sec\left(\frac{4\pi}{3}\right)$ iii. $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ v. $\sin\left(\sin^{-1}(0.8)\right)$
 ii. $\tan^{-1}(1)$ iv. $\csc^{-1}(2)$ vi. $\sin^{-1}\left(\sin\left(\frac{5\pi}{4}\right)\right)$

- (c) Simplify the following. Your answers should be algebraic expressions of x (not involving any trigonometric or inverse trigonometric functions).

i. $\cos(\cos^{-1}(x))$ iii. $\sin(\cos^{-1}(x))$ v. $\tan\left(\cos^{-1}\left(\frac{x}{2}\right)\right)$
 ii. $\cos(\sin^{-1}(x))$ iv. $\sec(\tan^{-1}(4x))$ vi. $\csc\left(\cot^{-1}\left(\frac{3x}{5}\right)\right)$

3. Exponential and Logarithmic Functions:

- (a) Evaluate the following.

i. $e^{\ln(75)-2\ln(5)}$

ii. $\log_{\frac{1}{2}}(32)$

iii. $\ln(9e^2) + \ln(\sqrt{9e}) - \ln(27e^{1/3})$

(b) Solve the following equations.

i. $2^{5x-1} = 4^{-3x}$

ii. $\log_4(x+5) - \log_4(x) = 2$

iii. $e^{2x} - 3e^x - 10 = 0$

4. **Inverse Functions:** each function below is one-to-one. Find the inverse function.

(a) $f(x) = (x+8)^{7/4}$

(c) $f(x) = 5 + 2e^{3x+1}$

(e) $f(x) = \ln(x) - \ln(x-3)$

(b) $f(x) = \frac{3-2x}{4x+7}$

(d) $f(x) = 1 - \arcsin(x^3)$

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