2.6 Trigonometry: a Refresher

EVALUATE EACH OF THE FOLLOWING EXPRESSIONS. DO NOT USE A CALCULATOR.

413.	$\tan \frac{\pi}{4}$	418.	$\sin^2\frac{5\pi}{6} + \tan^2\frac{\pi}{6}$	423.	$\sin(\arctan 1)$
414.	$(\sin\frac{3\pi}{4})(\cos\frac{5\pi}{4})$	419.	$\arcsin \frac{1}{2}$	424.	$\tan(\sec^{-1}2)$
415.	$\sec \frac{4\pi}{3}$	420.	$\arctan \frac{1}{\sqrt{3}}$	425.	$\sin(\arcsin 0.3)$
416.	$\cos(-\frac{\pi}{4})$	421.	$\sin^{-1}(-\frac{\sqrt{3}}{2})$	426.	$\arcsin(\sin \pi)$
417.	$\sin(\frac{\pi}{2} - \frac{\pi}{6})$	422.	$\tan^{-1}(-\sqrt{3})$	427.	$\arccos\left(\cos\left(-\frac{\pi}{4}\right)\right)$

428. Which of the following are undefined?

a) $\operatorname{arccos} 1.5$ b) $\operatorname{arcsec} 1.5$ c) $\operatorname{arctan} 1.5$ d) $\operatorname{arcsec} 0.3$ e) $\operatorname{arcsin} 2.4$

EVALUATE THE FOLLOWING LIMITS. GRAPH THE FUNCTIONS ON YOUR CALCULATOR IF NEC-ESSARY.

429. $\lim_{x \to 1^+} \sin^{-1} x$ **431.** $\lim_{x \to 1} \csc^{-1} x$ **433.** $\lim_{x \to -\infty} \arctan x$
430. $\lim_{x \to 1} \sec^{-1} x$ **432.** $\lim_{x \to \infty} \arctan x$ **434.** $\lim_{x \to \infty} \arccos x$

435. We know $\sin x$ is an odd function and $\cos x$ is an even function, but what about these?

a) $\arccos x$ b) $\arcsin x$ c) $\arctan x$ d) $\sec x$ e) $\csc x$

Find exact solutions to each of the following equations over the interval $[0, 2\pi)$.

436.	$\cos 3\theta - 1 = 0$	439.	$2\sin^2\theta - 3\sin\theta + 1 = 0$
437.	$\tan 2x + 1 = 0$	440.	$2\cos^2\theta + \cos\theta = 0$
438.	$\sin 3\theta + \frac{\sqrt{2}}{2} = 0$	441.	$\cos x + 2 \sec x = -3$

442. Water is draining from a tank. The volume of water in the tank is given by $V(t) = 1000 + (20 - t)^3$, where V is in gallons and t is the number of hours since the water began draining. Answer the following questions using correct units.

- a) How much water is in the tank initially?
- b) How fast is it draining after 10 hours?
- c) Will the tank have been completely drained after two days? Why?

Any fool can know. The point is to understand. $-Albert \ Einstein$

2.12 The Return of Geometry

522. Find the area and circumference of a circle of radius 7.

523. Find the volume of a cylinder with radius 8 and height 10.

524. Find the volume and surface area of a sphere of radius 9.

525. Find the volume and surface area of a cube of side length 6.

526. Find the volume and surface area of a box with dimensions 3, 4, and 5.

527. What is the hypotenuse of a right triangle with legs 5 and 12?

528. The area of an isosceles right triangle is 8. What is the length of its hypotenuse?

529. A cylinder is constructed so that its height is exactly 4 times its radius. If the volume of the cylinder is 500π , then what is its radius?

530. In the figure to the right, DE = 2, EC = 5, and AB = 5. Find the lengths of \overline{AC} and \overline{BC} .



531. What is the area of an equilateral triangle if its side lengths are 8?

532. What is the area of a semicircle of radius 10?

533. The trough shown in the figure at the right is 5 feet long and its vertical cross sections are inverted isosceles triangles with base 2 feet and height 3 feet. Find the volume of water in the trough when the trough is full.



534. A cone is constructed so that its height is exactly 4 times its radius. If the volume of the cone is 324π , then what is its radius?

535. A 12-foot ladder is leaning against a wall so that it makes a 60° angle with the ground. How high up the wall does the ladder touch the wall?

536. An equilateral triangle has an area of $4\sqrt{3}$. What is the height of this equilateral triangle?

All the pictures which science now draws of nature and which alone seem capable of according with observational fact are mathematical pictures. -Sir James Hopwood Jeans