Pre-Calculus 12B

Unit Test: Radian Measure **Name:____________________________**

<u>Instructions:</u> Show all work for each of the following in the space provided. **[52 Marks]**

1. Solve the following trigonometric equation: $\sin x(1+2\cos x)=0$, $-4\pi \le x < 2\pi$ [5]

2. (a) Convert the following to degree measure: 5.8 rad [2]

(b) Convert the following to radian measure: 100° [2]

(c) Determine the principal angle of $\frac{-41\pi}{6}$ in radians. [2]

3. Without using a calculator, evaluate the following: [12]

(Must include a separate sketch for each angle)

$$5\csc\left(\frac{47\pi}{6}\right) - 3\sec^2\left(\frac{-47\pi}{4}\right) + \sqrt{3}\tan\left(\frac{-22\pi}{3}\right) - 2\sin\left(\frac{31\pi}{2}\right) - \cos(27\pi)$$

4. Solve each of the following trigonometric equations:

(a) $3\cos^2 x - 7\cos x = 6$, $-360^\circ \le x \le 720^\circ$ [6]

(b) $(2\sin\theta + 3)^2 - 3\sin\theta = 2\sin\theta(\sin\theta + 3) + 8$, $-2\pi \le \theta \le 3\pi$ [10]

5. (a) A special vehicle for traveling on glacial ice has tires that are 2.15 m in diameter. If the vehicle travels at 1.8 km/h, determine the angular velocity of the tire in **radians/second**? [3]

(b) A windmill blade that is 14 m in length makes 6 revolutions in 47 seconds. Assuming the blades continue rotating at the same rate, determine how far the tip of one of these blades would travel after 3 minutes. [4]

6. A rodent population in a particular South American region varies with the number of predators that inhabit the region. At any time, the rodent population, $r(t)$, can be approximated using the equation

$r(t) = 2500 + 1500\cos\left(\frac{\pi t}{6}\right)$, where t is the number of years that have passed since 1990.

(Function is assuming that angles are being measured in radian measure)

(a) Determine the rodent population in the year 2003? [2]

(b) Determine TWO years in which the rodent population reached 1750 between the years 1990 and 2000? [4]