MA1032 Exam III: Non-calculator Name <u>Key R</u>

1. Give the exact value for the following.

a)
$$\cos \frac{5\pi}{6} = \frac{-\sqrt{3}}{2}$$
 b) $\sin(-225^{\circ}) = \frac{1}{\sqrt{2}}$

c)
$$\sec\left(\frac{\pi}{3}\right) = 2$$
 d) $\tan^{-1}\left(\sqrt{3}\right) = \frac{\pi}{3}$ (in radians)

- 2. Classify the following as even functions, odd functions, or neither.
 - a) $f(x) = 5 x^4$ **Even** b) $g(x) = \cos x$ **Even**

c)
$$h(x) = \begin{cases} x^2 & x \ge 0 \\ -x^2 & x < 0 \end{cases}$$
 Odd d) $j(x) = \tan x$ Odd

3. Give an equation for the graph on the right in terms of the graph on the left.



- 4. Make and accurate sketch of each graph. Use the values on the vertical axis but put your own numbers on the horizontal axis.
 - a) $y = 2\sin(3x)$





MA1032 Exam III: With calculator Name <u>R</u>

You must show supporting work to get full credit.

5. A 7.4 meter wire is fastened to the top of a vertical pole and anchored to the ground at and angle of 65°. What is the height of the pole?

 $7.4 \sin (65^\circ) = 6.7$ meters

6. The $\cos\theta = -0.4747$ and the angle is $-\pi < \theta < \frac{-\pi}{2}$. a) Find $\sin\theta$ b) Find $\cot\theta$

 $\sin^{2} \theta = 1 - (-0.4747)^{2}$ $\sin^{2} \theta = 0.7746$ $\sin \theta = -0.8801$ $\cot \theta = \frac{-0.4747}{-0.8801} = 0.5393$

7. Solve the equation for all answers between -2π and $+2\pi$.

 $(3\sin 3x - 2)(2\cos x + 1) = 0$ $3\sin 3x - 2 = 0$ $\sin 3x = \frac{2}{3}$ $3x = \sin^{-1}\left(\frac{2}{3}\right) = 0.7297, \pi - 0.7297, 2n\pi + 0.7297, (2n + 1)\pi - 0.7297, \quad n = -3, -2, -1, 0, 1, 2$ 3x = 0.730, 2.412, 7.013, 8.695, 13.296, 14.978, -3.871, -5.553, -10.155, -11.837, -16.438, -18.120 x = 0.2432, 0.8040, 2.3376, 2.8984, 4.4320, 4.9927, -1.2904, -1.8512, -3.3848, -3.9455, -6.4792, -6.0399 $2\cos x + 1 = 0$ $\cos x = \frac{-1}{2}$ $x = \cos^{-1}\left(\frac{-1}{2}\right) = \frac{2\pi}{3}, 2\pi - \frac{2\pi}{3}, -\frac{2\pi}{3}, -2\pi + \frac{2\pi}{3}$ $x = \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{-2\pi}{3}, -\frac{4\pi}{3} = 2.0944, 4.1888, -2.0944, -4.1888$ 8. Find an equation for each of the graphs.



EC.In a stable environment predator-prey populations follow a sine-cosine relationship (respectively). When the prey population is at its peak the number of predators is growing the most rapidly and when the predators are the fewest the number of prey are growing most rapidly. So they have the same period and phase shift. (But different amplitudes and midlines.) One such environment of foxes and rabbits was monitored and 4 months into the study the rabbit population peaked at 1200 rabbits while the fox population was 95 and growing. Then at month 9 the foxes had peaked at 130 and the rabbits were at 920 and decreasing. Find modeling equations for these two populations.

$$fox = 35\sin\left(\frac{2\pi(x-4)}{20}\right) + 95$$
 and $rabbit = 280\cos\left(\frac{2\pi(x-4)}{20}\right) + 920$