

## Quiz Five Solutions

MATH 120A SPRING, 2002

- 1 One solution of  $\cos(\theta) = 0$  is  $\theta = \cos^{-1}(0) = \pi/2$ , so one quadratic we can solve is  $\pi x^2 - \pi x = \cos^{-1}(0) = \pi/2$ , or  $x^2 - x = 1/2$ . Writing this as  $2x^2 - 2x - 1 = 0$ , we solve using the quadratic formula:

$$x = \frac{+2 \pm \sqrt{2^2 - 4(2)(-1)}}{2(2)} = \frac{2 \pm \sqrt{12}}{4} = \frac{1 \pm \sqrt{3}}{2}.$$

Other answers are possible using other values of  $\theta$ .

- 2 (a) We simplify by writing  $4^{1-x} = 4^1 \cdot 4^{-x}$  and  $4^{-x} = (4^{-1})^x = (1/4)^x$ . Thus  $A(x) = 3 \cdot 4 \cdot (1/4)^x = 12(1/4)^x$ .
- (b) Again we simplify:  $5^{2x-1} = 5^{2x} \cdot 5^{-1} = (5^2)^x \cdot (1/5)$ . Thus  $A(x) = 2 \cdot (1/5) \cdot (25)^x = (2/5)25^x$ .

- 3 We wish to solve  $75 \sin(\pi t + 3\pi/2) = 75/2$ , or  $\sin(\pi t + 3\pi/2) = 1/2$ . The first solution is

$$\pi t + 3\pi/2 = \sin^{-1}(1/2),$$

or

$$t = \frac{1}{\pi} \left( \sin^{-1}(1/2) - \frac{3\pi}{2} \right) = \frac{1}{\pi} \left( \frac{\pi}{6} - \frac{3\pi}{2} \right) = -4/3.$$

Another solution is

$$\pi t + 3\pi/2 = \pi - \sin^{-1}(1/2),$$

or

$$t = \frac{1}{\pi} \left( \pi - \sin^{-1}(1/2) - \frac{3\pi}{2} \right) = \frac{1}{\pi} \left( \pi - \frac{\pi}{6} - \frac{3\pi}{2} \right) = -2/3.$$

Other times can be found by adding the period (which is 2 minutes):  $t = -4/3 + 2 = 2/3$ ,  $t = -2/3 + 2 = 4/3$ ,  $t = 2/3 + 2 = 8/3$ , and so on. These are the first three times.