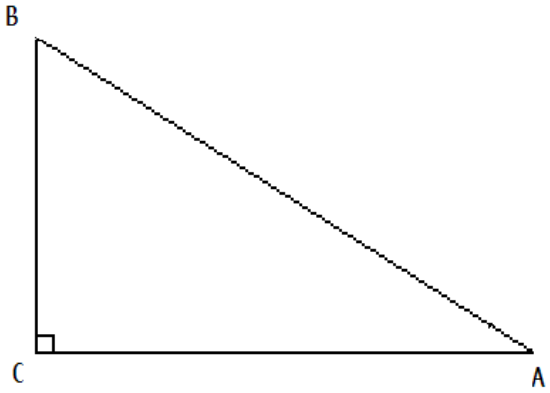
Name: _____

Math 32, Spring 2010, Section 101
Quiz 7

(1) (3 pts) In the triangle below, $\angle B = 60\,^\circ$. If $AC = 16$cm, find BC and AB.



Since $\sin 60 = AC/AB$, we get $AB = AC/\sin 60 = 16/(\sqrt{3}/2) = 32/\sqrt{3} = 32\sqrt{3}/3$. Similarly, $\tan 60 = AC/BC$ so $BC = AC/\tan 60 = 16/\sqrt{3} = 16\sqrt{3}/3$.

(2) (4 pts) Assume that the population of a bacteria colony grows exponentially (i.e. according to the law $N(t) = N_0 e^{kt}$.) At the start of an experiment, 2000 bacteria are present in a colony. Two hours later, the population is 3800.
(a) Determine the constants N_0 and k in the model.
(b) When will the population reach 10000?

(a) Plugging in $t = 0$ gives $N_0 = 2000$. Plugging in $t = 2$ gives $3800 = 2000e^{2k}$. Dividing (and noting that $3800/2000 = 19/10$) we get $19/10 = e^{2k}$, or $k = \frac{1}{2}\ln(19/10)$.

(b) We are solving $10000 = 2000e^{kt}$ where k is as in (a). Dividing by 2000 gives $5 = e^{\frac{t}{2}\ln(19/10)}$ or $\ln 5 = \frac{t}{2}\ln(19/10)$. Solving we get $t = 2\ln 5/\ln(19/10) = 2\log_{19/10}(5) = \log_{19/10}(25)$.

(3) (3 pts) Find the values of $\cos\theta$, $\tan\theta$ and $\csc\theta$ given that $\sin\theta = 3/4$ and that θ is acute. Rationalize the denominator of any fractions.

We can think of this as a right triangle with angle θ, opposite leg length 3 and hypotenuse legnth 4. The pytahgorean theorem says the adjacent leg has length $\sqrt{7}$. Filling in, we get $\cos\theta = \sqrt{7}/4$ and $\tan\theta = 3/\sqrt{7} = 3\sqrt{7}/7$. To get $\csc\theta$, we just take the reciprocal of $\sin\theta$ to get $\csc\theta = 4/3$.