
EXAM

Exam 3,
Takehome Exam

Math 1321, Spring 2007

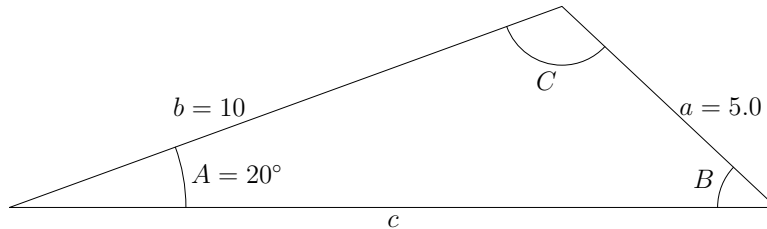
April 23, 2007

- This is a takehome exam **due April 30**.
- You can look at the book and your notes. You may discuss the exam with other students, but write up your own solutions!
- Write all of your answers on separate sheets of paper. You can keep the exam questions.
- You **must** show enough work to justify your answers. Unless otherwise instructed, give exact answers, not approximations (e.g., $\sqrt{2}$, not 1.414).
- This exam has 8 problems. There are **380 points total**.

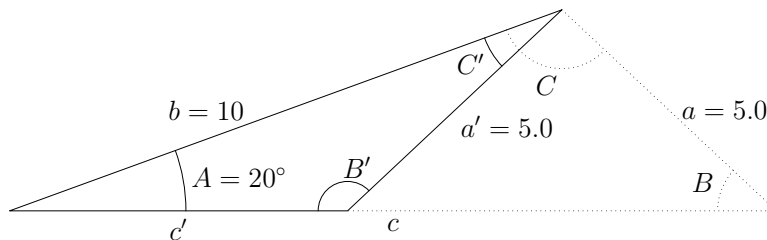
Good luck!

40 pts. **Problem 1.** A wheel has a radius of 2 feet. If the wheel is rolling along the ground and is rotating at 105 revolutions per minute, how fast is it traveling over the ground, in miles per hour?

60 pts. **Problem 2.** Solve the two triangles with $b = 10$, $A = 20^\circ$ and $a = 5.0$. In other words, first solve for B , C and c in the triangle



and then solve for B' , C' and c' in the solid triangle below



80 pts. **Problem 3.** Find the period and amplitude of the function $f(x) = 3\sin(x/2)$. Sketch the graph of this function on the interval from 0 to 8π . Label the points on the graph whose x coordinate is an integer multiple of $\pi/2$. How far, and in what direction, do you have to shift the graph of $f(x) = 3\sin(x/2)$ to get the graph of $g(x) = 3\sin(x/2 + \pi/4)$? Sketch the graph of $g(x)$ on the interval from 0 to 8π , labelling points on the graph as above.

40 pts. **Problem 4.** Express $y = \sqrt{3}\sin(\theta) - \cos(\theta)$ in the form $y = k\sin(\theta + H)$ or, if you prefer, in the form $y = k\cos(\theta + H)$.

40 pts. **Problem 5.** Prove the following identity.

$$\frac{\tan^2(A)}{\cos^2(B)} - \frac{\tan^2(B)}{\cos^2(A)} = \tan^2(A) - \tan^2(B).$$

40 pts. **Problem 6.** Express $\sin(3\theta)$ in terms of $\cos(\theta)$ and/or $\sin(\theta)$.

40 pts. **Problem 7.** Compute the exact values of $\sin(\pi/12)$, $\cos(\pi/12)$ and $\tan(\pi/12)$.
No decimal approximations!

40 pts. **Problem 8.** Solve the equation

$$\sin(4\theta) \csc(2\theta) + 8 \sin^2(\theta) = 5$$

for θ in the interval $0 \leq \theta < 2\pi$. Give exact values, not decimal approximations.
