MATH 116-023 QUIZ 4 / 2 Feb 2006 Name:_____

The following may or may not be useful things to know.

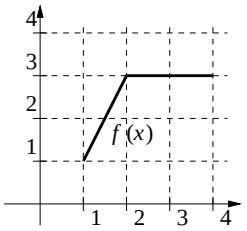
$\int \frac{1}{x^2+a^2}\,dx = \frac{1}{a}\arctan(\frac{x}{a}) + C,\ a \neq 0$ $\quad$ $\int \frac{bx+c}{x^2+a^2}\,dx = \frac{b}{2}\ln|x^2+a^2| + \frac{c}{a}\arctan(\frac{x}{a}) + C,\ a \neq 0$

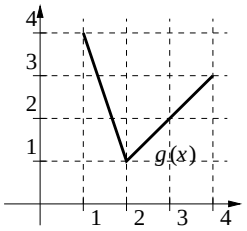
$\int \frac{1}{\sqrt{a^2-x^2}}\,dx = \arcsin(\frac{x}{a}) + C,\ a \neq 0$ $\quad$ $\int \frac{1}{(x-a)(x-b)}\,dx = \frac{1}{b-a}(\ln|x-a| - \ln|x-b|) + C,\ a \neq b$

$\int \frac{1}{\sqrt{x^2 \pm a^2}}\,dx = \ln|x + \sqrt{x^2 \pm a^2}| + C$ $\quad$ $\int \sqrt{a^2 \pm x^2}\,dx = \frac{1}{2}(x\sqrt{a^2 \pm x^2} + a^2 \int \frac{1}{a^2 \pm x^2}\,dx) + C$

1. An alert University of Michigan squirrel (major: undecided, but leaning towards math) notices that the rate at which students in calculus II pass a gateway test is given by $r(t) = \frac{2ke^{kt}}{(1+e^{kt})^2}$ (in %/day after the test opens), where k is a positive constant that depends on what section of the course the students are in. Find the percent of students who have passed after t days. What happens to this as $t \to \infty$? (3 points)

2. The second cousin of our mathematically inclined squirrel wants to get a piece of the action. "Given the graphs of $f(x)$ and $g(x)$, below," she says, "you can find $\int_1^4 f(x) \cdot g'(x)\,dx$ in at least two different ways."





Find the value of this integral in two different ways. (4 points)

3. Find $\int \frac{1}{x^2+5x+6}\,dx$ by using partial fractions. (3 points)