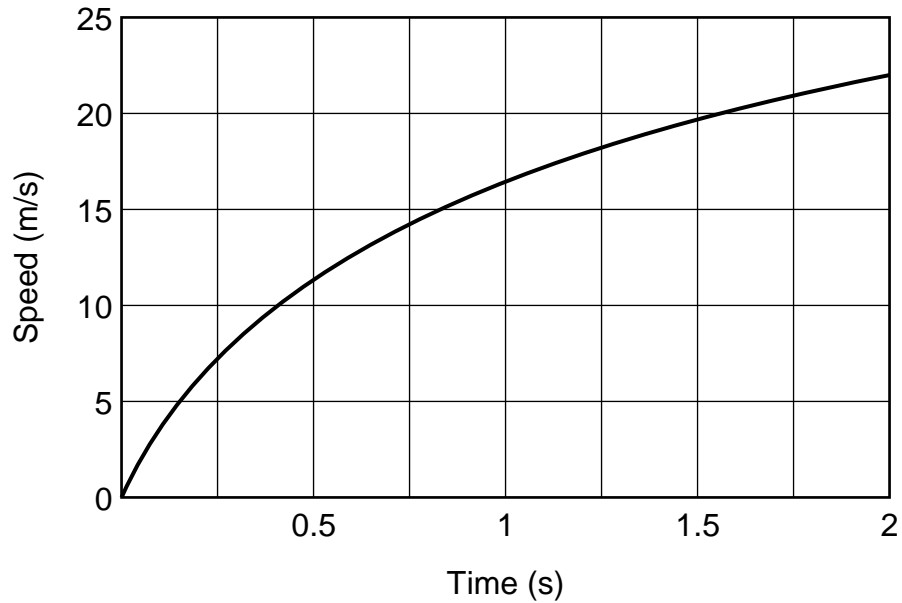# Math 141

Name:_____

Homework 12

1. The following graph shows the speed of a cheetah during the first two seconds of a sprint:

Estimate the distance run by the cheetah during the first two seconds as accurately as you can. (Your answer must be correct to within 2 meters to receive full credit.)

2. For each of the following integrals, show algebraic steps that must be used to evaluate the integral using the Fundamental Theorem of Calculus. For example:

$$\int_1^2 x^2\, dx \;=\; \left[\frac{1}{3}x^3\right]_1^2 \;=\; \frac{1}{3}(2)^3 - \frac{1}{3}(1)^3 \;=\; \boxed{\frac{7}{3}}$$

The answers are given to help you check your work.

(a) $\displaystyle\int_0^{\pi/8} \sin(4x)\, dx$ (Answer: 1/4)

(b) $\displaystyle\int_1^9 \frac{1}{\sqrt{x}}\, dx$ (Answer: 4)

(c) $\displaystyle\int_0^2 \left(3x^2 e^{3x} + 2x e^{3x}\right) dx$ (Answer: $4e^6$)

(d) $\displaystyle\int_0^{\pi/2} \sin^2(x)\cos(x)\,dx$ (Answer: 1/3)

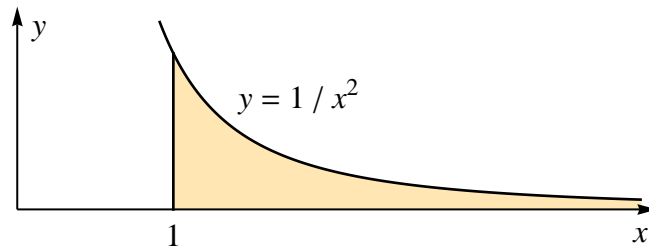(e) $\displaystyle\int_0^1 \frac{1}{1+x^2}\,dx$ (Answer: $\pi/4$)

(f) $\displaystyle\int_0^2 \frac{3x^2}{1+x^3}\,dx$ (Answer: ln 9)

3. (a) The following figure shows the region under the curve $y = 1/x^2$ from $x = 1$ to $x = b$.
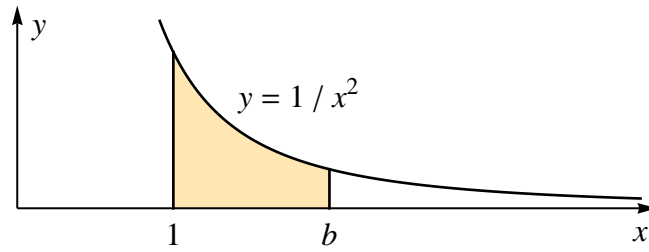
Use the Fundamental Theorem of Calculus to find a formula for the area of this region in terms of b.

(b) The following figure shows the entire region under the curve $y = 1/x^2$ to the right of $x = 1$.

What is the total area of this region? Justify your answer.