Supplement on Improper Integrals  Sec 7.5
work sheet 5
One type of improper integral has its upper bound approaching infinity.

\[ \int_a^\infty f(x)dx = \lim_{b \to \infty} \int_a^b f(x)dx \]

Assignment:

1. \[ \int_1^\infty \frac{1}{x^3}dx = \]
2. \[ \int_0^\infty e^{-x}dx = \]
3. \[ \int_2^\infty \frac{1}{3x}dx = \]
4. \[ \int_0^\infty e^{-5x}dx = \]

5. The board of directors of a corporation is calculating the price to pay for a business that is forecast to yield a continuous flow of profit of $500,000. If the money will earn a nominal rate of 5% per year compounded continuously, what is the value of the business in the long run? Let t = time in years.

Value = \[ \int_0^\infty 500,000 e^{-0.05t} dt = \]

6. A geologist estimates that an oil well produces barrels of oil at a rate of \( B(t) = 85e^{-0.02t} - 85e^{-0.1t} \) where B is in thousands of barrels per month. Estimate the total amount of barrels to be produced by this well.

7. The rate at which a certain hazardous chemical is being released into a lake from an abandoned dump is given by \( f(t) = 350e^{-0.3t} \) tons per year, t years from now. Determine the total amount of the hazardous chemical that will be released into the lake if the leak continues indefinitely.

8. A student in this class (who will remain anonymous) is planning to establish a scholarship fund after graduation. The scholarship fund will need to produce $8000 per year indefinitely. Determine the capital value needed to be invested at 7% interest compounded continuously in order to fund this scholarship.

More practice with improper integrals:

A. \[ \int_1^{1200} \frac{800}{t^2} dt \]
B. \[ \int_1^\infty \frac{1}{x^2} dx \]
C. \[ \int_0^\infty e^{4x^2} dx \]
D. \[ \int_1^\infty \frac{1}{\sqrt{x}} dx \]
E. \[ \int_1^\infty \frac{1}{x} dx \]