1. The price $p$ at which $x$ bags of cat food ($x \geq 1$) can be sold is given by the demand function

\[ p = -3 \ln x + 16.5 \]

Simplify all answers

\[ e \approx 2.71828 \]

(a) Find the total revenue function.

(b) Find the marginal revenue function.

(c) How many bags of cat food must the company sell in order to maximize revenue?

(d) What price per bag of cat food must be charged in order to maximize revenue?
2. Sketch the graph of \( f(x) = \frac{18}{x^2 - 9} \) by finding the following:

(a) Intercepts

(b) Asymptotes

(c) Derivatives

(d) Relative extrema
(e) Increasing / decreasing

(f) Inflection points

(g) Concavity

(h) Sketch the graph
3. Find the exact absolute extrema of $g(x) = e^{x^2-2}$ over the interval $[-1, 2]$.

4. Simplify $\log 10 + \ln e$

5. Differentiate $f(x) = xe^{-3x}$

6. If $\log_b 2 = 1.957$ and $\log_b 5 = 4.544$, find $\log_b 20$. 

7. Differentiate $\ln \left[ \frac{31x^2 - 4}{(3x - 7)^2} \right]$. You may leave the answer as two simplified fractions.

8. How much of 400 grams of strontium-90 will remain after 125 years if the half-time of strontium-90 is 25 years?

\[ e \approx 2.71828 \]
9. Suppose that $P_0$ is invested in a saving account in which interest is compounded continuously at 3.5 % per year. That is, the balance $P$ grows at the rate given by

$$\frac{dP}{dt} = 0.035P.$$

(a) Find the function that satisfies the equation. List it in terms of $P_0$ and 0.035.

(b) Suppose that $10,000 is invested. What is the balance after four years?

(c) When will the value of $10,000 double?

Extra Credit 1: Evaluate $\int \left(e^{2x} - 2xe^{-1}\right) dx$

Extra Credit 2: What day of the week, month, day of the month, and time is the final for Math 211?