



Math 151 Week-In-Review 11

4.4, 4.5, 4.7 (4.5 is not technically covered in Math 151, but it is a review of 4.3)

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Problem Statements

1. Evaluate the following limits.

(a) $\lim_{x \rightarrow 5} \frac{\sqrt{x} - 5}{x - 25}$

(b) $\lim_{t \rightarrow 0} \frac{4^t - 10^t}{t}$

(c) $\lim_{y \rightarrow \infty} \frac{\sqrt{y^2 + 3}}{\sqrt{y^2 - 5}}$



2. Evaluate the following limits.

(a) $\lim_{x \rightarrow \infty} x^{3/2} \sin(1/x)$

(b) $\lim_{t \rightarrow 0} (\csc(t) - \cot(t))$

(c) $\lim_{y \rightarrow \infty} y^{1/y}$



3. Evaluate the following limits.

(a) $\lim_{x \rightarrow 1} \frac{x^x - 1}{\ln x + x - 1}$

(b) $\lim_{x \rightarrow \infty} \left(\frac{3x - 2}{3x + 7} \right)^{3x+1}$



4. Consider $f(x) = x^4e^{-x}$. Find the following:

(a) Domain, Asymptotes, and Intercepts

(b) Intervals of Increase/Decrease, Locations of Local Extrema

(c) Intervals of Concavity, Locations of Inflection Points

(d) Sketch a Graph



5. Consider $f(x) = \frac{\ln x}{x}$. Find the following:

(a) Domain, Asymptotes, and Intercepts

(b) Intervals of Increase/Decrease, Locations of Local Extrema

(c) Intervals of Concavity, Locations of Inflection Points

(d) Sketch a Graph



6. Find the point on the curve $f(x) = 3x - 8$ that is closest to $(2, 4)$.

7. Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest from the point $(1, 0)$.



8. A farmer wants to fence in a rectangular area of land adjacent to his barn. The area does not need fencing along the side of the barn. If the farmer has 1000 feet of fencing available, what is the largest area he can enclose?
9. The farmer goes to install the fence, only to discover the wood he was going to use is no good, and he will need to purchase new fencing. He decides he just wants to buy enough fencing to enclose an area of 100,000 sq. ft. The barn runs parallel to a road, and he decides it would be good to purchase reinforcing fencing for the fence adjacent to the road. The reinforced fencing costs \$10 per foot, and the basic fencing cost \$8 per foot. What lengths of each fence should he purchase to enclose his land under these constraints for the least amount of money?



10. A cable is 100 ft long. It is to be cut into two pieces, and the two pieces will be fashioned into two shapes, an equilateral triangle and a circle. Determine the length of cable that should be used on each shape such that the total area of the two shapes is as large as possible.
11. A right circular cylinder is inscribed in a sphere of radius r . Find the largest possible volume of such a cylinder.