

Homework # 6
Due: Never

1 New Material

1. Use the guidelines of this section to sketch the curve.

(a) $f(x) = 20x^3 - 3x^4$

(b) $f(x) = \frac{x^2}{x^2-9}$

(c) $f(x) = \sin x$

2. If 1200 cm² is available to make a box with a square base and an open top, find the largest possible volume of the box. (Hint: You'll need to consider the area of each side. But remember which sides you have and which you don't.)
3. A fence 8 ft tall runs parallel to a tall building at a distance of 4 ft from the building. What is the length of the shortest ladder that will reach from the ground over the fence to the wall of the building? (Hint: You're going to need to use similar triangles for this).

2 Review Material

This section has problems that might be like the ones on the exam. They won't be exactly like this, and it's possible that not all the material here will be covered on the exam. Basically, if it's on here then it's fair game for the exam. If it's not on here, then still learn it, but don't worry about it for the exam. Keep in mind two things, however. First, just because the material isn't given an explicit problem here, it still may be needed to do another problem. Second, all trig functions are valid for all of the material (limits, derivatives, graphing, etc.) and step functions are valid for problems involving limits.

1. Graph the following functions not by plotting points or using the material covered at the end of the course, but by starting with a known function and transforming it.

(a) $y = -\sin x$

(b) $y = \frac{1}{x+2}$

(c) $y = 1 + \frac{1}{2}x^3$

2. If $f(x) = \sqrt{x}$ and $g(x) = \sin x$, then find $f \circ g$ and $g \circ f$ as well as their domains.
3. Evaluate $\lim_{x \rightarrow -2} \sqrt{x^4 + 3x + 6}$ using the limit laws. You don't need to state the exact limit law you're using.
4. Find the following limits.

(a) $\lim_{x \rightarrow 3} \frac{x^2-9}{x^2+2x-3}$

(b) $\lim_{x \rightarrow 0} \cos(x + \sin x)$

(c) $\lim_{x \rightarrow 4^+} \frac{4-x}{|4-x|}$

(d) $\lim_{x \rightarrow 0} \frac{1-\sqrt{1-x^2}}{x}$

(e) $\lim_{x \rightarrow \infty} \frac{3x+5}{x-4}$

(f) $\lim_{x \rightarrow \infty} \frac{x+2}{\sqrt{9x^2+1}}$

(g) $\lim_{x \rightarrow -\infty} \frac{x+x^3+x^5}{1-x^2+x^4}$

5. Find y' for the following:

(a) $y = \cos(\tan x)$

(b) $y = \frac{3x-x}{\sqrt{2x+1}}$

(c) $y = \frac{1}{(x+\frac{1}{x^2})^3}$

(d) $y = \frac{\tan \sqrt{x}}{1+\sin x}$ (This one will be messy)

(e) $xy^4 + x^2y = x + 3y$

(f) $\sin(xy) = x^2 - y$

6. Find an equation of the tangent line to the curve $y = 4 \sin^2 x$ at the point $(\pi/6, 1)$

7. A lighthouse is located on a small island 3km away from the nearest point P on a straight shoreline and it slight makes for revolutions pre minute.. How fast is the beam of light moving along the shoreline when it is 1km away from P ?

8. Find the local maximum and minimum values of $f(x) = x^3 - 27x + 10$ using both the first and second derivative tests

9. Find both the local and absolute maxima and minima of the function on the given interval.

(a) $f(x) = x - \sqrt{x}$, $[0,4]$

(b) $f(x) = \frac{x}{x^2+x+1}$, $[-2, 0]$

(c) $f(x) = \sin x + \cos^2 x$, $[0, \pi]$