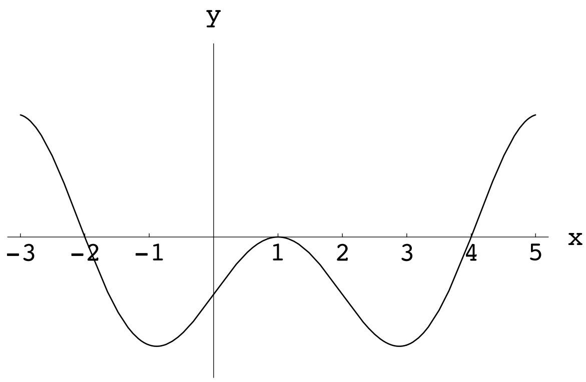
Review Chp. 5

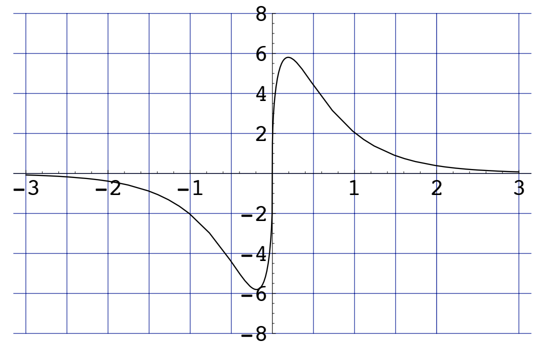
Show all relevant work!

1. Identify all critical points and inflection points for each function $f(x)$ graphed below. Then identify relative and global extrema.

(a)

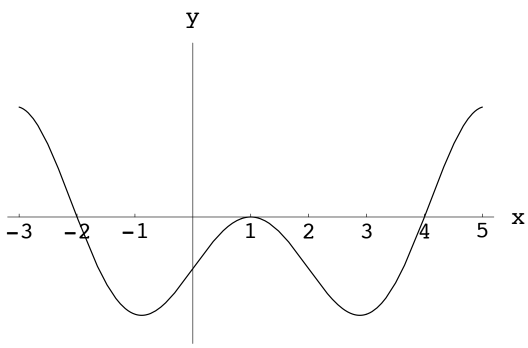


(b)

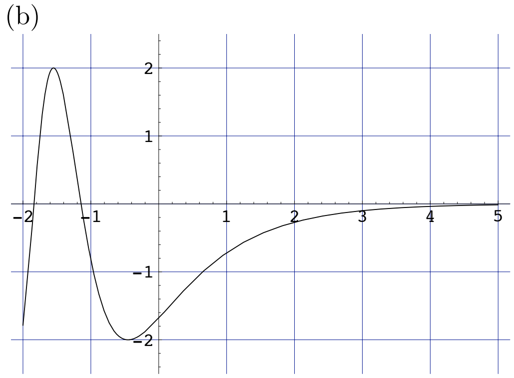


2. Suppose the graphs below are of derivative functions, $f'(x)$. Identify critical points of the original function $f(x)$ and indicate whether these points are local maximums, minimums, or neither.

(a)

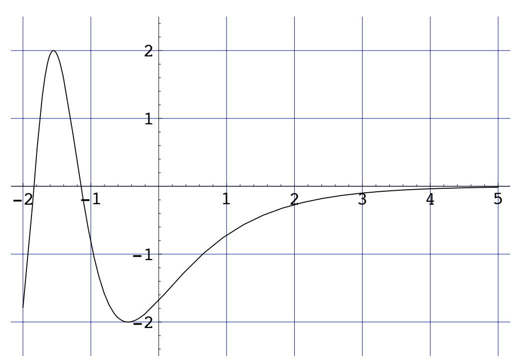


(b)



3. Recall that the graphs in #2 are of $f'(x)$ and identify where $f(x)$ is concave up and concave down for each graph.

4. If this is the graph of $g''(x)$, where is $g(x)$ increasing the fastest? Where is $g(x)$ decreasing the fastest?
Where is $g(x)$ concave up?
Can you tell where $g(x)$ has a relative maximum?

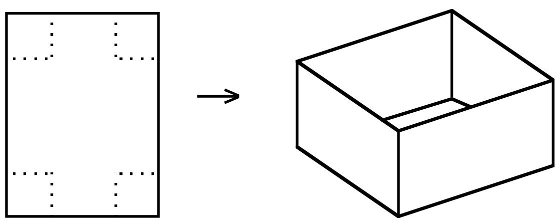


$\boxed{5.}$ Consider the function $h(x) = x^2 - \ln x$ on the interval $[.1, 2]$. Find all local and global extrema for $h(x)$. How would your results change if the domain was $(0, 2]$?

$\boxed{6.}$ For each of the functions given below, identify all critical points and inflection points. Identify local and global extrema (recall that if you assume the domain is $\mathbb{R}$, then you test the "ends" by computing $\lim_{x \to -\infty} f(x)$ and $\lim_{x \to \infty} f(x)$). Also find all inflection points.

(a) $y = 2 + 5x + x^2 - x^3$ (b) $f(x) = xe^{-x}$ (b) $g(x) = \dfrac{1}{x^2 + 1}$ (c) $h(x) = x^3 - \ln(x^2)$

$\boxed{7.}$ Currently open boxes for birdseed are stamped from single rectangular sheets of 8" $\times 11\frac{1}{2}$" sheet metal by removing squares at the corners and folding up the sides (see diagram below). Management is concerned with the waste of precious volume and requests that the box with optimal volume be designed and used for containing birdseed. Write an appropriate function to maximize and apply calculus to determine the size of the squares that should be cut out. Give the maximum volume that can be held.



$\boxed{8.}$ When you throw a stone into a pond the ripples expand radially from the place where the stone hit the water. If the radius of the ripple from a particular stone increases at a rate of 2ft/sec, how quickly is the area of the circle increasing when $r = 6$ ft?

$\boxed{9.}$ If the half-life of Carbon–14 is 5730 years,

a) What is the relative decay rate after 500 years? (as a percent over time)

b) What is the absolute rate of decay of 10grams of C–14 after 500 years? (in grams over time)

$\boxed{10.}$ Suppose that you run a pizza shop. From years of experience you know that if you charge \$12 for a cheese pizza, you will sell an average of 70 for the week. Whereas if you charge \$9 for the same pizza, you will sell 98 pizzas. Write a linear demand equation and use it to determine the price that will maximize the weekly revenue from cheese pizza sales.