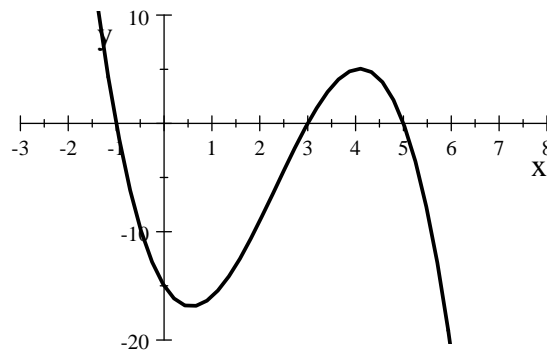
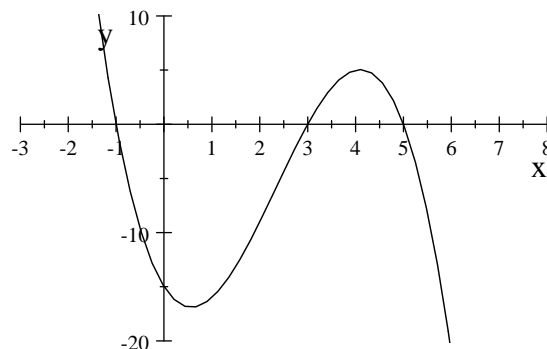


Review Sheet for Dr. Yang's Math 151

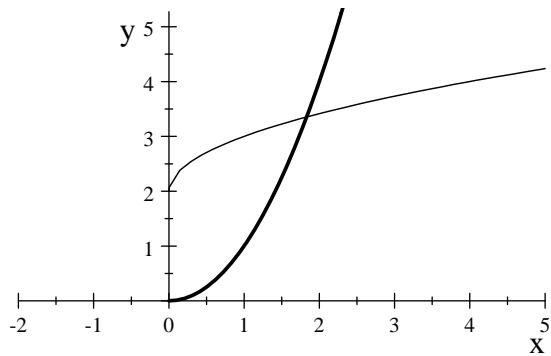
1. If the graph of f is given below:



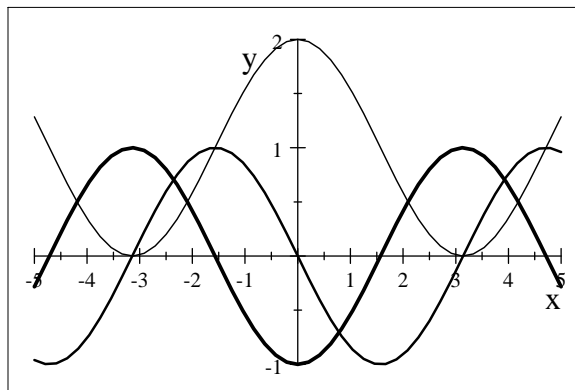
- a. Compare $f'(-1), f'(0), f'(1), f'(2)$ in increasing order. [Answer: $f'(-1) < f'(0) < f'(1) < f'(2)$.]
 - b. Find the interval(s) where f' is positive. [Answer: f' is positive estimately in $(0.5, 4)$ where f is increasing.]
 - c. Find the interval(s) where f' is negative. [Answer: f' is negative estimately in $(-\infty, 0.5) \cup (4, \infty)$.]
2. If the graph of f' (derivative of a function) is given below:



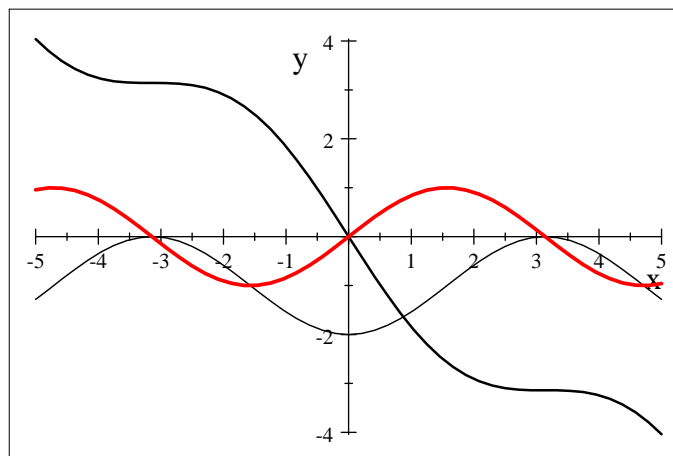
- a. Compare $f'(-1), f'(0), f'(1), f'(2)$ in increasing order. [Note that you are looking at the graph of $y = f'(x)$ not $y = f(x)$; so $f'(-1) = 0, f'(0)$ is about $-15, f'(1)$ is -16 and $f'(2)$ is about -10 , so $f'(1) < f'(0) < f'(2) < f'(-1)$]
 - b. Indicate the ' x - value' where f has relative maxima. [Answer: f has a relative maximum when f' is changing from positive to negative, so f has a relative maximum at $x = -1$ and at $x = 5$.]
 - c. Indicate the ' x - value' where f has relative minimum. [Answr: f has a relative minimum at $x = 3$.]
3. Given the position funtions for two race cars f (thin) and g (thick) are shown as follows and suppose the graphs of $y = f(x)$ and $y = g(x)$ intersect at $x = 1.8$. Then answer the following questions:



- a. Do these two cars start at the same position? [No]
 - b. Which car starts out faster? [car f].
 - c. Where do these two cars meet? [At time $x = 1.8$]
 - d. Compare $f'(x)$ and $g'(x)$ for $x \geq 1.8$. [$g'(x) > f'(x)$ if $x \geq 1.8$.]
4. Label the graphs for f, f' and f'' . [Answer: f is thin, f' is medium and f'' is thick.]

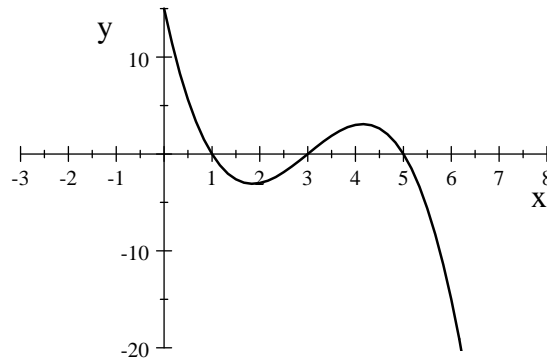


5. If the graphs of $y = f(x), y = f'(x)$ and $y = f''(x)$ are given below: Then

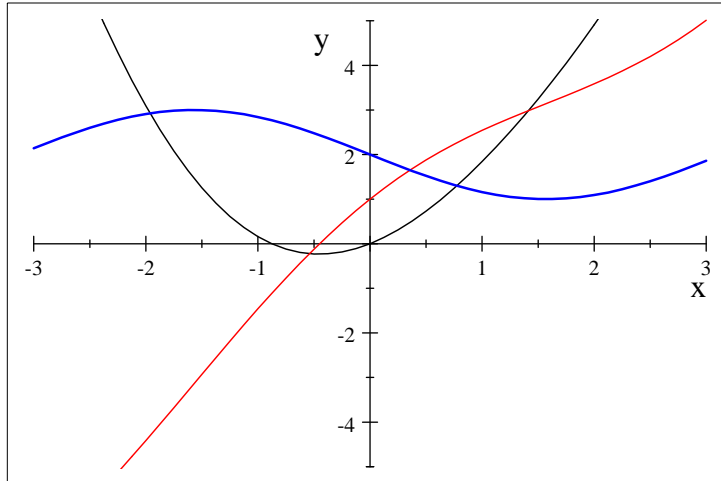


- a. identify the graph for $y = f(x), y = f'(x)$, and $y = f''(x)$ respectively. [f is the one always decreasing, f' is thin in black and f'' is red].

- b. find the interval(s) where f is increasing or decreasing, [f is always decreasing]
 - c. find the maximum and minimum for f in the interval $[0, 2\pi]$, [f has no relative max or min.]
 - d. find the interval(s) where f is concave upward and concave downward. [Look at f'' (red), f'' is negative roughly in $(-3, 0) \cup (3, 5)$ so f is concave downward in $(-3, 0) \cup (3, 5)$; f'' is positive in $(-5, -3) \cup (0, 3)$ roughly, so f is concave upward in $(-5, -3) \cup (0, 3)$. By the way, f has an inflection point at $x = -3, 0$ and 3 .]
6. Let the graph of a velocity function ($x = \text{time}$, $y = \text{feet/sec}$) be given below: Assuming the x -intercepts for the following graph is at $x = 1, 3$, and 5 .



- a. What is the initial velocity (when $\text{time}=0$)?
 - b. Explain how velocity function can be negative sometimes.
 - c. Estimate the inflection point(s) for the distance function.
 - d. Estimate the maximum and minimum for the distance function.
 - e. Find the interval(s) where the acceleration is negative.
7. If the graphs of $y = f(x)$, $y = f'(x)$ and $y = f''(x)$ are given below: Then
- a. identify the graph for $y = f(x)$, $y = f'(x)$, and $y = f''(x)$ respectively.
 - b. find the interval(s) where f is increasing or decreasing,
 - c. find the maximum and minimum for f in the interval $[-3, 3]$,
 - d. find the interval(s) where f is concave upward and concave downward by using the signs of f'' .



8. If $f'(x) = e^x - x^3 + 2$.
- Use the graph of $y = f'(x)$ to find the interval(s) where f is increasing or decreasing,
 - Use the graph of $y = f'(x)$ to find the maximum and minimum for f ,
 - Use the graph of $y = f'(x)$ to find the inflection points of f when $x \in [-5, 5]$.