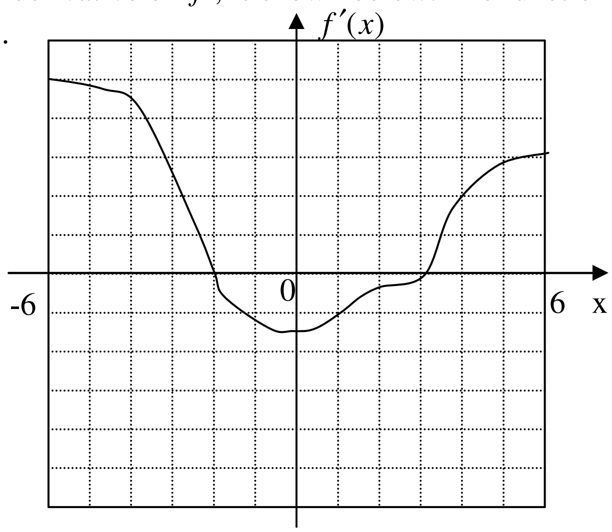
1. Given $f(x) = 6x^5 - 10x^3$.
   (a) Find the x-coordinates of all maximum and minimum points.
   (b) State the intervals on which f increases.

2. If $f(x) = x^4 - 4x^3$, where is the graph of f concave downward?

3. The graph of f', the derivative of f, is shown below. The function f is defined on the interval [-6,6].



   (a) Determine the interval(s) where f is decreasing.
   (b) Find the x-coordinate of any local maximum point.
   (c) Determine the interval(s) where the graph of f is concave upward.

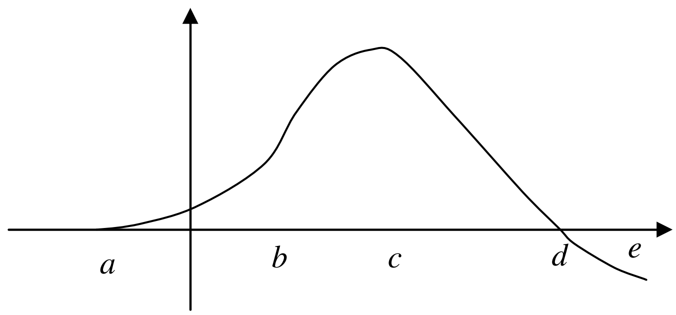
4. Find the coordinates of the inflection point(s) for $f(x) = xe^x$.

5. For what values of c and d does $f(x) = x^3 + cx^2 - 3x + d$ have an inflection point at (1,1)?

6. Water flows into a right conical container at the rate of 2 cubic feet per minute. The container is 9 feet high and 6 feet across the top. At what rate is the water level rising when the water is three feet deep? (The volume of a cone is $V = \frac{1}{3}\pi r^2 h$.)

7. The acceleration of a particle in ft/sec^2 is given by the function $a(t) = 6t - 15$. At time t = 0 seconds, the velocity is 12 ft/sec, and its position is at 0 feet.What is the position of the particle at t = 10 seconds?

8. The function $f(x)$ is graphed below:



(a) Use the graph to complete the following chart for each interval.
Use + for positive, and – for negative.

Interval \ Function	$f(x)$	$f'(x)$	$f''(x)$
(a,b)			
(b,c)			
(c,d)			
(d,e)			

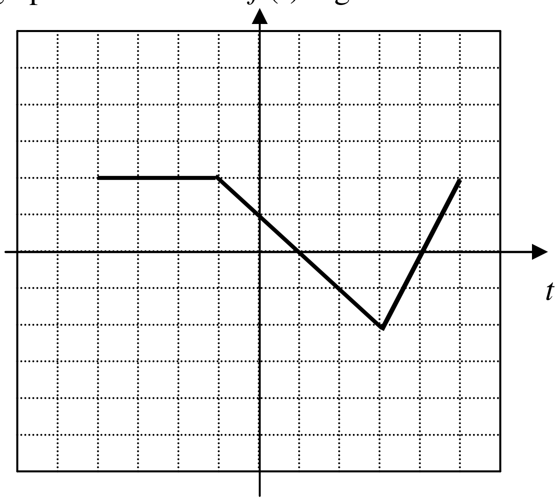
(b), using your chart, describe in a sentence the behavior of the function on the interval (b,c).

9. A rancher wishes to create a 4000 square meter rectangular enclosure. Two fences parallel to two of the sides will be used to create three equal areas. Find the dimensions of the fence that will require the least amount of fencing.

10. Let $f(x)=\frac{x}{2}+3$ be defined on the closed interval [-2, 4]. Estimate the area under the graph of f above the x-axis using:
(a) 6 left-endpoint rectangles (b) 6 right-endpoint rectangles

11. Let $g(x)=-x^2+6x-4$ be defined on the closed interval [1,5]. Estimate the area under the graph of g above the x-axis by using 8 trapezoids.

12. The graph of a function $f(t)$ is given below.



(a) Evaluate $\int_{-2}^{3} f(t)dt$

(b) If $F(x)=\int_{0}^{x} f(t)dt$, determine the value of $F'(2)$.

13. Determine the area bounded by the graphs of $f(x)=4-x^2$ and $g(x)=x^2-4$.

14. Evaluate the integrals and decide which has the greater value. (Assume $a > 0$).

$\int_{a}^{2a} \frac{dx}{x}$ or $\int_{3a}^{6a} \frac{dx}{x}$

15. Find the average value of the function $f(x)=\sin x$ on the interval $[0,\pi]$. Draw a picture to illustrate the meaning of the average value.

16. Draw the graph of the function $f(x)=|x-3|$ on the interval [0,6], and use this graph to evaluate $\int_{0}^{6} |x-3| dx$.

17. A colony of bacteria grows at a rate proportional to the number present. At the end of three hours there are 10,000 bacteria. At the end of 5 hours, there are 40,000. How many bacteria were present initially?

18. Evaluate the following integrals:

(a) $\int_{1}^{2} \frac{4}{x^2} dx$ (b) $\int \left(3x^2 - 5x^{-\frac{1}{3}} \right) dx$

(c) $\int_{0}^{1} 2x\left(x^2+1\right)^3 dx$ (d) $\int_{1}^{9} \left(t^2 - \sqrt{t}\right) dt$

(e) $\int_{1}^{2} \frac{dx}{3x+4}$ (f) $\int \left(x^2-3\right)^2 dx$

(g) $\int_{0}^{1} \left(e^x + 2\right) dx$

19. Find the antiderivatives of the following functions:
(a) $f(x) = x^2 - 4x$ (b) $g(x) = 4\sin x + \sqrt{x}$

20. The graph of a function *F(x)* has a slope of $2x^3 - 4$ at each point (x,y), and contains the point (2,1). Determine the function *F(x)*.