

**Critical Points**

Find all the critical points of the following functions.

1.  $g(t) = (t-1)^2(t^2-16)^3$

2.  $P(t) = 2\sin(4t) + t + 15$

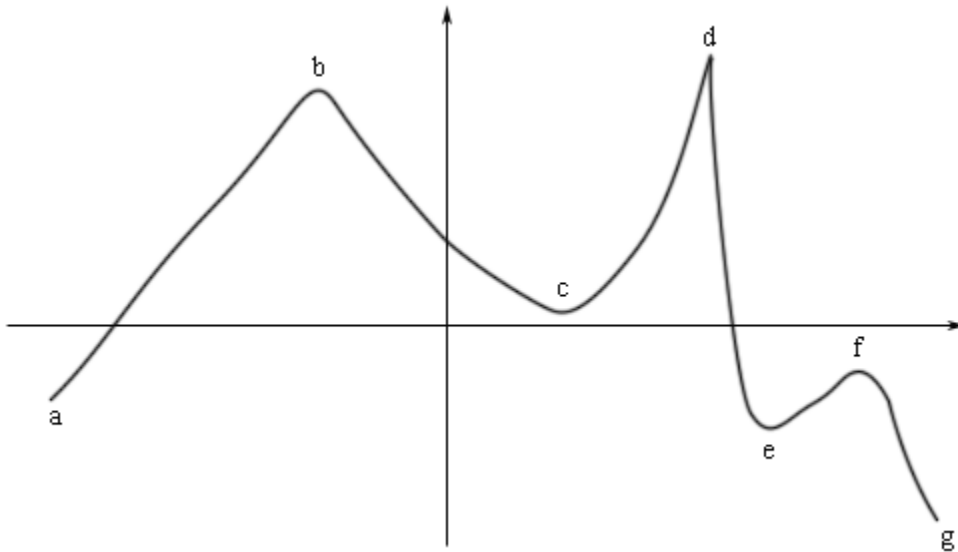
3.  $g(x) = 12 + 80x^3 - 5x^4 - 4x^5$

4.  $V(t) = t^2(5-t)^{\frac{1}{3}} + 20$

5.  $R(t) = 4 + (4t-10)e^{1-(t-3)^2}$

**Minimum and Maximum Values**

6. Below is the graph of some function. Identify the relative and absolute extrema of the function.

**Finding Absolute Extrema**

For problems 7 & 8 find the absolute extrema of the function on the given interval.

7.  $g(t) = (t-1)^2(t^2-16)^3$  on  $[-5, 5]$

8.  $g(x) = 12 + 80x^3 - 5x^4 - 4x^5$  on  $[-1, 4]$

Continued on Back  $\Rightarrow$

For problems 9 – 11 you MUST use Calculus techniques to answer the question and if you need to use decimals for any problem use at least 4 decimal places. Also, please take advantage of any work you've done previously in this homework set to make your life easier.

9. The voltage in a rechargeable battery is given by,

$$V(t) = t^2(5-t)^{\frac{1}{3}} + 20$$

where  $t$  is in hours. If the voltage ever rises above 35 Volts the battery will explode. Is the battery safe (*i.e.* it does not explode) in the first 5 hours of operation?

10. The population of rabbits in a field (in hundreds) is given by,

$$P(t) = 2\sin(4t) + t + 15$$

where  $t$  is in years. In the first  $2\frac{1}{2}$  years what is the minimum and maximum population of rabbits?

11. In a certain chemical process the process will not explode provided the amount of the chemical present is always between 1 gram and 10 grams. If the amount of this chemical (in grams) at any time ( $t$  is in hours) is given by,

$$R(t) = 4 + (4t - 10)e^{1-(t-3)^2}$$

will the chemical remain safe (*i.e.* not explode) during the first 3 hours of operation?

### The Shape of a Graph, Part I

For problems 12 & 13 find the intervals in which the function is increasing and decreasing. Also, find and classify all the critical points of the function. If you need to use decimals for any problem use at least 4 decimal places.

12.  $g(x) = 12 + 80x^3 - 5x^4 - 4x^5$

13.  $W(x) = 1 + \frac{1}{2}x^2 + \ln(8 - 2x)$  on  $[-5, 4)$