

Critical Points

Find all the critical points of the following functions.

1. $g(z) = (4z^2 - 1)^3 (6 - 3z)^4$

2. $f(x) = 8x + 16 \sin\left(\frac{x}{2}\right) + 2$

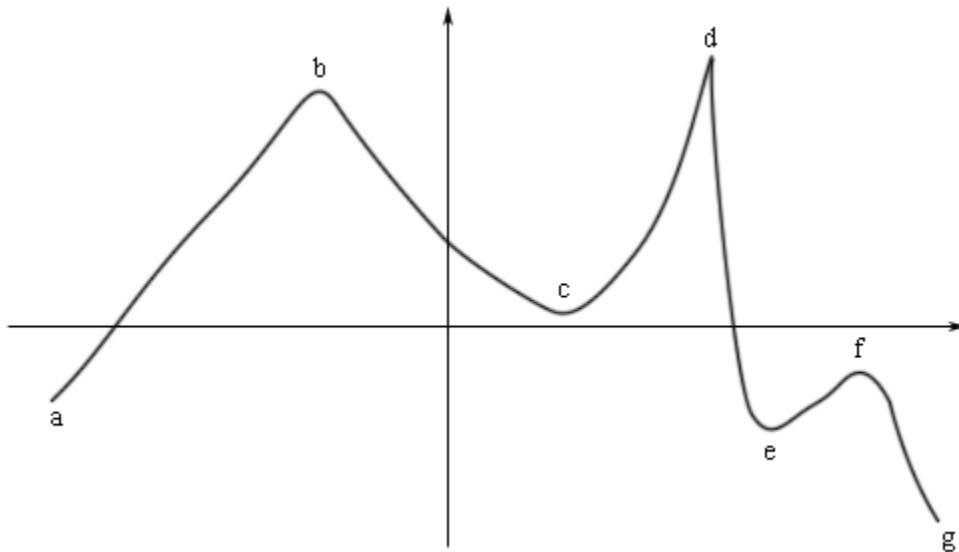
3. $h(x) = 5x^6 - 12x^5 - 60x^4$

4. $P(t) = (1 + t^2) \sqrt[3]{3t - 21} + 75$

5. $W(y) = \ln(3y + 6) - 4 \ln(y^2 + 6)$

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. $g(z) = (4z^2 - 1)^3 (6 - 3z)^4$ on $[-1, 1]$

8. $P(t) = (1 + t^2) \sqrt[3]{3t - 21} + 75$ on $[0, 8]$

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For problems 9 & 10 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 population (in hundreds) of fish in some pond is given by,

$$P(t) = (1+t^2) \sqrt[3]{3t-21} + 75$$

where t is in years. It is known that if the population ever rises above 20,000 there will not be enough food for all the fish. During the first 8 years does the population ever rise above 20,000?

10. The amount of coolant (in gallons) in a machine is given by

$$V(t) = 60 - e^{2t^3 - 6t^2 + 9t}$$

where t is in hours. If the level of the coolant ever falls below 10 gallons the machine will need to be shut down to prevent damage. During the first 2 hours of operation will the machine get shut down?

The Shape of a Graph, Part I

For problems 11 & 12 find the intervals in which the function is increasing and decreasing and classify all the critical points of the function. If you need to use decimals for any problem use at least 4 decimal places. Again, please take advantage of any work you've done previously in this homework set to make your life easier.

11. $f(x) = 8x + 16 \sin\left(\frac{x}{2}\right) + 2$ on $[-15, 25]$.

12. $f(x) = 3x^5 - 5x^4 - 60x^3$