EMCF 18

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1. Give the smallest value of x where the derivative of $f(x) = x^4 + 8x^2 - 1$ is zero.
   a. 0
   b. 1
   c. -1
   d. 2
   e. -2
   f. None of these.
2. Zoom in on the graph of $f(x) = x^4 + 8x^2 - 1$ at the values of x below. Which of these looks like the top of a hill?
   a. 0
   b. 1
   c. -1
   d. 2
   e. -2
   f. None of these.
3. Zoom in on the graph of $f(x) = 1 - 8x^2 - x^4$ at the points where the derivative is zero. How many of these look like the top of a hill?
   a. 0
   b. 1
   c. 2
   d. 3
   e. 4
   f. None of these.
4. Zoom in on the graph of $f(x) = 1 - 8x^2 - x^4$ at points where the derivative is zero. How many of these look like the bottom of a valley?
   a. 0
   b. 1
   c. 2
   d. 3
   e. 4
   f. None of these.
5. The function $f(x) = 1 - 3x + x^3$ has a zero derivative at $x = 1$. Zoom in on the graph at this point and describe what you see.
   a. Top of a hill.
   b. Bottom of a valley.
   c. Neither the top of a hill nor the bottom of a valley.
   d. None of these.

6. Give the number of intervals within the interval [-3,5] on which the function $f(x) = 3\cos^3(2x) + x$ is increasing. **Hint:** Create a graph and count them.
    a. 1
    b. 2
    c. 3
    d. 4
    e. 5
    f. None of these.
7. Give the number of intervals within the interval [-1,5] on which the function $f(x) = \left|3\cos^3(2x) + x\right|$ is increasing. **Hint:** Create a graph and count them.
    a. 1
    b. 2
    c. 3
    d. 4
    e. 5
    f. None of these.
8. Select an interval below on which $f(x) = x^4 + 8x^2 - 1$ is decreasing.
    a. [-2,0]
    b. [-2,1]
    c. [-1,1]
    d. [-1,2]
    e. [0,2]
    f. None of these.
9. Give the number of intervals on which $f(x) = 3x - x^3$ is decreasing.
    a. 1
    b. 2
    c. 3
    d. *f is never decreasing*
    e. 4
    f. None of these.
10. Give an interval on which $f(x) = 3x - x^3$ is increasing.
    a. $x > 1$
    b. $x < -1$
    c. [-2,2]
    d. [-1,1]
    e. None of these.