Applications of First and Second Derivative

I. Find the x-intercept and the y-intercept. (No calc)

1. $f(x) = x^2 + 12x + 32$

2. $f(x) = x^3 - 12x^2 + 35x$

3. $f(x) = 4x^2 + 16x + 15$

4. $f(x) = x^4 - 13x^2 + 36$

II. Find the critical points of each of the following functions. Round to the nearest hundredth, if necessary.

5. $f(x) = x^2 - 2x + 4$

6. $v(t) = 8t^3 - t^2$

7. $f(x) = x^5 - 80x$

8. $f(x) = x^4 + x^3 - x^2 + 4$

III. Find the critical points and the intervals on which the function is increasing or decreasing. Use the First Derivative Test to determine whether the critical point is a local maximum, local minimum, or neither. Round to the nearest hundredth, if necessary.

9. $f(x) = -x^2 + 7x - 17$

10. $f(x) = x^3 - 12x^2$

11. $f(x) = x^2 + (10 - x)^2$

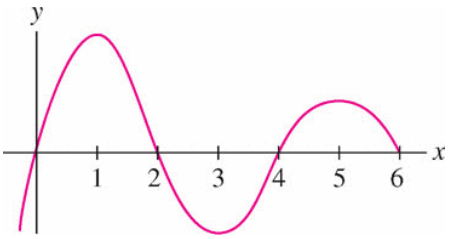
12. $f(x) = 3x^4 + 8x^3 - 6x^2 - 24x$

13. $f(x) = \frac{1}{3}x^3 + \frac{3}{2}x^2 + 2x + 4$

14. $f(x) = -x^4 + 3x^2 - 4$

15. Let f be a function whose derivative is given by $f'(x) = (x-2)^2(4x-2)$. Find all critical points and classify each one as a local maximum, local minimum, or neither.

IV. Given the following graph, answer the questions. Challenging, but give it a shot!!



16. Determine the intervals on which $f'(x)$ is positive and negative, assuming that the given graph is the graph of $f(x)$

17. Determine the intervals on which $f(x)$ is increasing or decreasing, assuming that the given graph is the graph of $f'(x)$

18. State whether $f(2)$ and $f(4)$ are local minimums or local maximums, assuming that the given graph is the graph of $f'(x)$

V. Determine the intervals on which the function is concave up or concave down and find the points of inflection. Round to the nearest hundredth, if necessary.

19. $f(x) = 10x^3 - x^5$

20. $f(x) = \frac{1}{2}x^4 + 2x^3$

21. $f(x) = \frac{1}{3}x^3 - x^2 - 3x + 1$

22. $D(r) = r^4 - 8r^2 + 16$

23. If $f''(x) = x(x+1)(x-2)^2$ then the graph of f has inflection points when $x =$

(A) -1 only (B) 2 only (C) -1 and 0 only (D) -1 and 2 only (E) $-1, 0,$ and 2 only

24. If $f(x) = \sqrt{x^2 - 4}$ and $g(x) = 3x - 2$, find the derivative of $f(g(x))$ at $x = 3$.