Increasing and Decreasing Functions

In problems 1-3, Find the critical numbers of the function.

1. $f(x)=9x^2-10x+2$	2. $f(x)=x^3-12x^2+36x+6$
3. $f(x)=\sqrt{3x^2-27}$	

In problems 4-19, Find the critical numbers and the open intervals on which the function is increasing or decreasing.

4. $f(x)=8x-2$	5. $f(x)=x^2-4x+3$
6. $f(x)=x^3+9x^2-21x+3$	7. $f(x)=x^4-4x^3-20x^2+8$
8. $f(x)=x^3-4x^2$	9. $f(x)=(x-4)^3$
10. $f(x)=\left(x^2-25\right)^4$	11. $f(x)=(x-3)^{1/5}+2$
12. $f(x)=(8x-1)^{2/3}+2$	13. $f(x)=\sqrt[3]{x^2-16}$
14. $f(x)=x\sqrt{x+2}$	15. $f(x)=\dfrac{x}{x^2-25}$
16. $f(x)=\dfrac{x-7}{x+1}$	17. $f(x)=\dfrac{x^2+x+4}{x+1}$
18. $f(x)=\begin{cases}5x-3, x\le 2\\ x^2+3, x>2\end{cases}$	19. $f(x)=\begin{cases}x^2-5x-1, x\le 0\\ 4x-1, \quad x>0\end{cases}$

20. The sales of a company are modeled by $S(t)=-2.01t^2+50.1t+200,\ 1\le t\le 10$ where t is in years. Determine increasing and decreasing intervals in the range between 1 and 10.

21. The progression of a disease follows the model $C=-2t^2+8t+10,\ 0\le t\le 5$ where C is the number of cases and t is the time in years. Determine the intervals where the number of cases is increasing and decreasing.

22. The profit of a company is modeled by $P(x)=3.12x-\dfrac{x^2}{20000}-10000,\ 0\le x\le 60{,}000$ where x is the number of units sold. Find the intervals where the profit is increasing and decreasing.