Name _____ Date _____

Unit 19: Intro to Calculus!!!

1. Find the slope of the tangent line to $y = x^3 - 6x$ at (2, -4)
2. Find the equation of the tangent line to $y = 2x^2 + x + 3$ at x = 3
3. Find the equation of the normal line ($\perp$) to $f(x) = x^2 - 6$ at (1, -5)
4. If $f(x) = x^3 - 2x^2$ then find $f'(x)$
5. If $g(x) = \sqrt{2x-1}$ then find $g'(x)$
6. If $p(x) = 2x^3 - x^2 - 3x + 2$ then find $p'(x)$
7. If $f(x) = \dfrac{2}{2x+1}$ then find $f'(x)$
8. Find $f'(x)$:
   a. $f(x) = (x+4)(x^2 - x + 6)$
   b. $f(x) = 3x^3 - 4x^2 + 11x + 5$
   c. $f(x) = \dfrac{2x+1}{5x+2}$

Graph each ~ Find the relative min and max points.

9. $y = x^3 - 6x^2 + 8x$
10. $y = \dfrac{2x^3 + 1}{x^2}$
11. $y = \dfrac{3x}{2x^2 + 1}$
12. Prove if $f(x) = \cos x$, then $f'(x) = -\sin x$

Find each limit:

13. $\lim\limits_{x \to 0} \dfrac{\sin x}{2x}$
14. $\lim\limits_{x \to 0} \dfrac{\sin 3x}{x}$
15. $\lim\limits_{x \to 0} \dfrac{\sin x}{x^2}$
16. $\lim\limits_{x \to 0} \dfrac{\sin^2 x}{3x^2}$
17. $\lim\limits_{x \to 0} \dfrac{\sin x}{1 - \cos x}$
18. $\lim\limits_{x \to 0} \dfrac{\tan 7x}{\sin 3x}$
19. $\lim\limits_{x \to 0} \dfrac{x}{\cos x}$

Graph each ~ Find the relative min/max points.

20. $y = x^3 - 2x^2$
21. $y = \dfrac{1 + x^4}{x^2}$

Find a partial fraction decomposition for each.

22. $\dfrac{x+15}{x^2-5x}$

23. $\dfrac{3x+50}{x^2-7x-18}$

24. $\dfrac{3x+16}{(x-2)(x^2+7)}$

25. $\dfrac{9x^2-3x+49}{(x-1)(x^2+10)}$

26. $\dfrac{2x^3-4x^2-x-3}{x^2-2x-3}$

27. $\dfrac{6x^3+6x^2-17x-12}{(x^2+2x)(x^2-3)}$

Review:

28. Graph: $y=2x^3+3x^2-36x$

29. Graph: $y=\dfrac{x^4+3}{x}$

30. Find the smallest positive number such that the number and its reciprocal have the smallest possible sum.

31. $f(x)=\dfrac{x^2}{x+2}$ Find: $f'(x)$

32. $f(x)=\sqrt{2x^2+1}$ Find: $f'(x)$

33. $\lim\limits_{x\to 0}\dfrac{\sin^2\left(\frac{1}{2}x\right)}{x}$

34. $\lim\limits_{x\to 0}(\csc x)$

35. $\lim\limits_{x\to 0}(x\csc x)$

36. $\lim\limits_{x\to 0}\dfrac{1-\sin x}{\sin x}$

37. Graph: $y=x^4-2x^2-8$