AP Calculus BC Name:_________________________________Period____

Unit 1– Wkst 3 – Definitions of Derivative, Differentiability, Power Rule for Derivatives

No calculator.

Find the derivative using the definition of derivative. Show all work. Use proper notation.

1. $f(x) = 2x^2 + x - 1$

2. $f(x) = \dfrac{1}{x-1}$

3. $g(x) = \sqrt{x-4}$

Find the derivative of each function at the given value of x, using the alternative form of the definition of derivative. Show all work. Use proper notation.

5. $f(x) = x^2 - 4$ at $x = 1$

6. $y = \dfrac{1}{x}$ at $x = 7$

7. State the three reasons a function is not differentiable at $x = a$.

For the following functions, state any values of x at which the function is not differentiable.

8. $f(x)=|5x-2|$

9. $f(x)=\dfrac{x^2-x-2}{x-2}$

10. $f(x)=\dfrac{1}{2x+1}$

11. $f(x)=x^{1/3}$

Find the derivative of each using the Power Rule for Derivatives.

12. $f(x)=x^3+5x^2-3x+8$

13. $f(x)=\dfrac{1}{x^5}$

14. $f(x)=\sqrt{x}-6\sqrt[3]{x}$

15. $y=x^3+\cos x$

16. $f(\theta)=\dfrac{\pi}{2}\sin\theta-\sec\theta$

17. $y=\dfrac{1}{x}-3\tan x$

18. $f(t)=t^2-\dfrac{4}{t^3}$

19. $y=\dfrac{x^3-3x^2+4}{x^2}$

Write the equation of the line tangent to each curve at the given point.

20. $y = x^4 - 3x^2 + 2$ at $(1,0)$

21. $f(x) = \dfrac{2}{\sqrt[4]{x^3}}$ at $(1,2)$

Determine the points at which the graph of the function has a horizontal tangent line.

22. $y = x + \sin x$, $0 \le x \le 2\pi$

State the function whose derivative is given by each limit.

23. $\lim\limits_{\Delta x \to 0} \dfrac{\sqrt{x+\Delta x} - \sqrt{x}}{\Delta x} =$

24. $\lim\limits_{h \to 0} \dfrac{\cos(x+h) + \cos x}{h} =$

25. $\lim\limits_{h \to 0} \dfrac{\left[3(x+h)^2 - 1\right] - \left(3x^2 - 1\right)}{h} =$

State the value of each limit.

26. $\lim\limits_{h \to 0} \dfrac{\tan\left(\dfrac{\pi}{6} + h\right) - \dfrac{\sqrt{3}}{3}}{h} =$

27. $\lim\limits_{\Delta x \to 0} \dfrac{(4+\Delta x)^{3/2} - 8}{\Delta x} =$

28. $\lim\limits_{h \to 0} \dfrac{\cos(\pi + h) + 1}{h} =$