AP Calculus BC

Derivative Worksheet

Find the derivative.

1. $f(x)=3x(x-4)$

2. $y=(2x)^4$

3. $y=x^2\sqrt{2x^3+4x}$

4. $f(x)=2\pi$

5. $f(x)=\dfrac{x^2-3}{2x-5}$

6. $y=\cos^4(x^2)$

7. $y=\dfrac{\cos x}{1+\sin x}$

8. $f(x)=\ln(e^x)$

9. $y=\sec x\tan x$

10. $y=\sqrt{1+\cos x}$

Find the equation of the tangent line to the function at the given point.

11. $f(x)=\sqrt{x}$ when $x=9$

12. $g(x)=\dfrac{1}{x+1}$, $(0,1)$

13. Find the derivative of $y=\dfrac{fg}{h}$, in terms of $f, g, h, f', g',$ and h', where $f, g,$ and h are functions of x.

14. Find the rate of change of $y=(4x^3+7x^2+1)^2$ at $x=-1$.

15. If $y=\sin^3 x$, find $\dfrac{d^2y}{dx^2}$.

16. Which of the following functions are NOT differentiable at $x=0$

I. $y=\sqrt{4-x^2}$ II. $y=x^{\frac{2}{3}}$ III. $y=x^{\frac{4}{3}}$ IV. $y=x^{-2}$ V. $y=\left|\sin\left(2x\right)\right|$

17. Consider the function given by $f\left(x\right)=\begin{cases} 2-x & , x\le 1 \\ x^2-x+1 & , x>1 \end{cases}$.

Is the function continuous, differentiable, both, or neither at $x=1$?

Free – falling objects. $s\left(t\right)=-16t^2+v_0t+s_0$.

18. A ball bearing is thrown upward from a height of 512 feet with a velocity of 64 feet per second.

a) Determine the position function.

b) Determine the velocity function.

c) What is the average velocity on the interval $\left[3,4\right]$.

d) Find the time required for the bearing to reach the ground.

e) What is the average velocity from the time the bearing is thrown till it hits the ground?

f) Find the velocity upon impact.

g) Find the acceleration upon impact.

h) Find the time it takes to reach its maximum height.

i) What is the velocity at this time?

j) What is the acceleration at this time?