AP Calculus Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.2 Basic Differentiation Rules and Rates of Change

“Differentiation rules” allow you to find derivatives without the direct use of the limit definition.

The Constant Rule



Find the derivative:

1) y = 7 2) f(x) = 0 3) s(t) = -3 4) y = 

The Power Rule The derivative of x

 

Find the derivative:

5) f(x) = x3 6) g(x) = x5 7) g(x) =  8) y = 

9) Find the slope of the graph of f(x) = x4 when a) x = -1, b) x = 0 and c) x = 1.

10) Find an equation of the tangent line to the graph of f(x) = x2 when x = -2.

The Constant Multiple Rule



Find the derivative:

11) y =  12)  13) 

14)  15)  16) 

17)  18)  19) 

The Sum and Difference Rules



Find the derivative:

20) f(x) = x3 – 4x + 5 21) g(x) = 

Derivatives of Sine and Cosine Functions

 

Find the derivative:

22) y = 2 sin x 23) y =  24) y = x + cos x

Rates of Change

A common use for rate of change is to describe the motion of an object moving in a straight line. Movement to the right (or upward) is considered to be in the positive direction, and movement to the left (or downward) is considered to be in the negative direction.

* Average Velocity is .
* Instantaneous velocity is the velocity at a specific time, such as t = 1.
* The velocity function is the derivative of the position function. Velocity can be negative, zero, or positive. The speed of an object is the absolute value of its velocity. Speed cannot be negative.

The position of a free-falling object (neglecting air resistance) under the influence of gravity can be represented by the equation:

 s0 = initial height v0 = initial velocity

g = acceleration due to gravity (on Earth, g is approximately -32 feet per second per second or -9.8 meters per second per second).

25) If a billiard ball is dropped from a height of 100 feet, its height s at time t is given by the position function, s = -16t2 + 100, where s is measured in feet and t is measured in seconds.

a) Find the average velocity over the time interval [1, 2].

b) Find the velocity of the ball at t = 1 second.

26) At time t = 0, a diver jumps from a platform diving board that is 32 feet above the water. The position of the diver is given by s(t) = -16t2 + 16t + 32 where s is measured in feet and t is measured in seconds.

a) When does the diver hit the water? b) What is the diver’s velocity at impact?

c) What is the diver’s initial velocity? d) When is the diver’s velocity zero?