BC Calculus Summer Packet 2025 Name: ______________________

Please complete each question. This packet will be scored for completion, but all work must be shown for full credit! Please box your final answer. This packet is DUE THE FIRST DAY OF CLASS! We will review it day 1 and day 2, and take a summer packet assessment on derivatives and their applications on the third day of class.

Solve the problem.

1) If $y = x^2 + 3$, find the equation of the tangent line to the graph of y at $x = -2$.

Determine the values of x for which the function is differentiable.

2) $y = \frac{-7}{x+5}$

3) $y = \sqrt{x^2 + 9}$

4) $y = \sqrt[3]{(x+2)} - 4$

Find dy/dx.

5) $y = (x^2 - 5x + 2)(3x^3 - x^2 + 5)$

6) $y = \frac{x^2}{5-7x}$

7) $y = \frac{6x^2+x-1}{x^3-4x^2}$

Suppose u and v are differentiable functions of x. Use the given values of the functions and their derivatives to find the value of the indicated derivative.

8) $u(1) = 4,\ u'(1) = 7,\ v(1) = 6,\ \ v'(1) = -2$

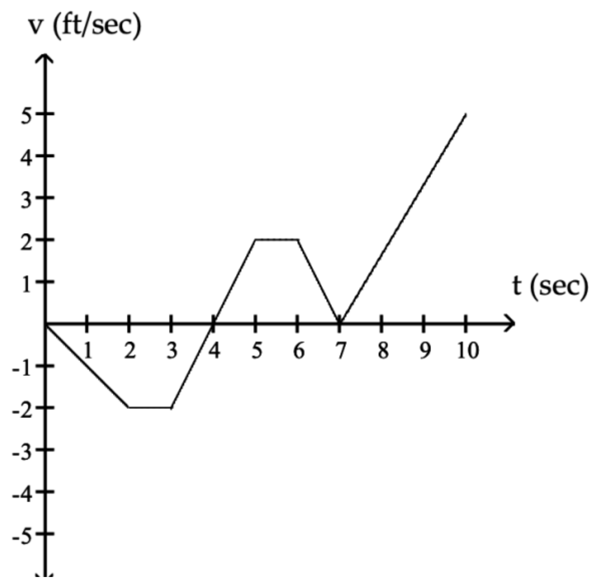
$$\frac{d}{dx}(uv)\ at\ x = 1$$

Find the slope of the line tangent to the curve at the given value of x.

9) $y = 3x^2 + 6x\ ;\ x = 2$

The figure shows the velocity v of a body moving along a coordinate line as a function of time t. Use the figure below to answer the question.

10)



When is the body's acceleration equal to zero?

Find dy/dx.

11) $y = 4tan^6 x$

12) $y = \frac{9}{sinx}$

13) $y = \frac{sinx}{2x}$

An object moves along the x-axis so that its position at any time $t \geq 0$ is given by $x(t) = s(t)$. Find the velocity of the object as a function of t.

14) $s(t) = \sin\left(\frac{\pi}{2} - 2t\right)$

Find dy/dx.

15) $y = 14\sqrt{sinx + tanx}$

16) $y = (secx + tanx)^{-5}$

Find $dr/d\theta$.

17) $r = \sqrt{10\theta tan\theta}$

18) $r = csc3\theta cot3\theta$

Find the equation for the line tangent to the curve at the point defined by the given value of t.

19) $x = 5sint\ , y = 5cost,\ \ t = \frac{3\pi}{4}$

Suppose that the functions f and g and their derivatives with respect to x have the following values at the given values of x. Find the derivative with respect to x of the given combination at the given value of x.

20) $\sqrt{g(x)}\ at\ x = 3$

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
3	1	9	8	3
4	-3	3	2	-5

Solve the problem.

21) The position of a particle moving along a coordinate line is $s = \sqrt{4 + 12t}$ with s in meters and t in seconds. Find the particle's acceleration at $t = 1$ sec.

Find dy/dx by implicit differentiation. If applicable, express the result in terms of x and y.

22) $3y + 8xy - 6 = 0$

Solve the problem.

23) Given $(x-3)^2+(y+2)^2=106$, find dy/dx and the slope of the curve at the point $(-6,3)$.

Find where the slope of the curve is defined.

24) $x = sin9y$

Use implicit differentiation to find dy/dx and d^2y/dx^2.

25) $x^2+y^2=8$

Find the derivative of y with respect to the appropriate variable.

26) $y = 2sin^{-1}(5x^3)$

A particle moves along the x-axis so that its position at any time $t \geq 0$ is given by $x(t)$. Find the velocity at the given value of t.

27) $x(t) = tan^{-1}(\frac{t}{5}),\ t = 2$

Find dy/dx.

28) $y = \log(3x - 1)$

Use logarithmic differentiation to find dy/dx.

29) $y = (cosx)^x$

Find the linearization $L(x)$ of $f(x)$ at $x = a$.

30) $f(x) = x + \frac{1}{x},\ a = 3$

Solve.

31) Given $y = x^2 \ln 3x$, find dy and evaluate dy for $x = \frac{1}{3}$ and $dx = 0.03$

Solve the problem.

32) A company wishes to manufacture a box with a volume of 40 cubic feet that is open on top and is twice as long as it is wide. Find the width of the box that can be produced using the minimum amount of material.

33) A container is the shape of an inverted right circular cone has a radius of 4.00 inches at the top and a height of 5.00 inches. At the instant when the water in the container is 2.00 inches deep, the surface level is falling at the rate of -2.00 in/sec. Find the rate at which the water is being drained.