

Understand continuity

Understand differentiability

Understand that a derivative is the slope of a function

Be able to relate the graph of a function with the graph of its derivative

Be able to calculate derivatives using the:

- Power rule

- Chain rule

- Product rule

- Quotient rule

Be able to calculate derivatives for:

- Polynomials

- Trig functions

- Exponential functions

- Logs and lns

Be able to write the equation of a line tangent to a function at a point

Be able to do implicit differentiation

Find the derivative of an inverse polynomial function

Use a position function to find a velocity function

Do related rate problems

Demonstrate an understanding of Newton's method to find a root

Chapter 3 Practice Test

1. What conditions must be true for a function to be continuous at a point where $x = c$?
2. Under what conditions is a function not differentiable at a point?
3. Find the equation of the line tangent to $f(x) = x^4 + 2x^2 - 5$ at $x = 1$.

Find the derivative of the function.

8. $f(x) = \frac{1}{2} x^{10}$
9. $f(x) = e^{2x+1}$
10. $f(t) = 5t^4 + 4t^3 - t^2 + 3t - 8$
11. $y = 4\cos \theta + 2\pi \sin \theta$
12. $y = \frac{8}{x^5}$
13. $f(x) = \frac{x^3}{x^2 + 2}$
14. $f(x) = (x^3 - 2x)(3x + 4)$
15. $f(t) = \frac{\sin t}{2t + 1}$
16. $g(x) = \cos 6x$
17. $f(t) = 9 \sin^2 4t$
18. $f(x) = -2 \ln x^4$
19. $y = \arctan 2x$
20. $h(x) = 2 \arcsin (x^2 - 2x)$
21. $y = \log_7 (x^2 + 5)$
22. Find dy/dx by implicit differentiation: $2x - 3y^2 = 16$

23. Find the second derivative of the function $g(x) = 1 + 4 \cos x$.

24. Let $f(x) = x^3 + 2$, and let g be the inverse of f . Find the value of g' when $f(x) = 10$

Original Function			Inverse Function		
x	f(x)	f'(x)	x	g(x)	g'(x)
	10				

25. The height of an object can be determined using the function $s(t) = -16t^2 + 40t + 52$ feet.

a. What is the object's velocity after 10 seconds?

b. What is its velocity after 25 seconds?

c. What is the maximum height the object reaches?

26. The radius of a sphere is expanding at a rate of 3 cm per second. How fast is the volume of the sphere changing when the radius is 8 cm long? $\text{Volume}_{\text{sphere}} = \frac{4}{3} \pi r^3$

27. The length of a rectangle is $5t^2 - 1$. The width of a rectangle is $2t + 1$. Time t is in seconds and the dimensions of the rectangle are in meters. Find the rate of change of the area with respect to time.

28. Use Newton’s method to find the zero for the function $f(x) = \sqrt{2x - 1} - 2$. Use $x = 2$ for your first iteration. Continue the process until two successive approximations differ by less than 0.001.

n	x_n	$f(x_n)$	$f'(x_n)$	$x_n - f(x_n)/f'(x_n)$