Calculus

Chapter 3: Differentiation

Lesson 2: Rules of Differentiation

Question #1

Reference Q.266

What is $\frac{dy}{dx}$ when $y = e^6$

Question #2

Reference Q.267

What is $\frac{dy}{dx}$ when $y = 3x^2$?

Question #3

Reference Q.7396

What is $f'(x)$ when $f(x) = \sqrt[3]{x^2}$?

Question #4

Reference Q.268

What is $f'(x)$ when $f(x) = 7x^7 + 3x^4 - 2x + 11$

Question #5

Reference Q.269

What is $f'(t)$ when $f(t) = 10t^3 + 5t^{-3} + 4\sqrt{t}$?

Question #6

Reference Q.270

What is $f'(t)$ when $f(t) = 2t^{-4} - \frac{1}{t^2} + \sqrt[5]{t^3}$

Question #7

Reference Q.271

What is $f'''(x)$ when $f(x) = x^n$

Question #8

Reference Q.273

Find $f'(2)$ when $f(x) = \frac{x^4}{4} + \frac{x^3}{3} - \frac{x^2}{2} + x - 1$

Question #9

Reference Q.274

Find $f'(3)$ when $f(x) = (3 - x)(3 - x^2)$

Question #10

Reference Q.275

A general polynomial given by $P(x) = ax^n + bx^{n-1} + cx^{n-2} + dx^{n-3} + \cdots$, Find $P'(x)$.

Question #11

Reference Q.277

What is $f'''(x)$ if $f(x) = 2x^3 - 3x + 2$?

Question #12

Reference Q.260

Find the equation of the tangent line to the curve $y = x^3 - 4x - 6$ at $x = -2$.

Question #13

Reference Q.278

What is $\frac{d^2y}{dm^2}$ if $y = \frac{1}{8m^2} - \frac{7}{5m}$?

Question #14

Reference Q.279

What is y''' if $y = 2x^{-1}$?

Question #15

Reference Q.280

What is $f^{(3)}(x)$ if $f(x) = 4x^{-4} + 3x^{-2} + x^3$?

Question #16

Reference Q.281

What is y''' if $y = ax^3 + bx^2 + cx + d$?

Question #17

Reference Q.282

What is $f^{(3)}(1)$ if $f(x) = 4x^5 + 3x^3 + 2x + 1$?

Question #18

Reference Q.283

What is $\frac{d^2y}{dx^2}|_{x=-2}$ if $f(x) = 3x^4 - 6x$?

Question #19

Reference Q.284

Coulomb's Law states that $F = \frac{kQq}{r^2}$ where k is Coulomb's constant, Q and q are the size of two charges, r is the distance between the charges and F is the force between them. What is the relationship between the rate of change of F with respect to r? In other words, find $\frac{dF}{dr}$.

Question #20

Reference Q.285

Find the derivative of the following function:

$y = (x-2)(x^2+1)$

(Be sure to check the detailed solutions to see the different ways to do this.)

Question #21

Reference Q.286

Find the derivative of the following function:

$y = \left(x^2+1\right)\left(x^2-2x-1\right)$

(Be sure to check the detailed solutions to see the different ways to do this.)

Question #22

Reference Q.288

What is y' when $y = (x^2+x)(2x+\frac{2}{x}+2)$?

Question #23

Reference Q.289

Find $f'(-2)$ when $f(x) = \frac{1}{4x+6}$.

Question #24

Reference Q.290

Find $\frac{dy}{dx}|_{x=3}$ when $y = \frac{3x+1}{2x^2-3}$.

Question #25

Reference Q.291

Calculate $f'(2)$ if $f(x) = \frac{3x}{5-x^2}$

Question #26

Reference Q.292

If $f(8) = 2$ and $f'(8) = -1$, find $g'(8)$ for $g(x) = \sqrt[3]{x}f(x)$.

Question #27

Reference Q.293

If $f(8) = 2$ and $f'(8) = -1$, find $g'(8)$ for $g(x) = \frac{f(x)}{x^2}$.

Question #28

Reference Q.294

For the equation $A(x) = 6u(x) - 3v(x)$, what is $A'(2)$ if $u(2) = -1$ and $u'(2) = 2$ and $v(2) = 1$ and $v'(2) = -2$?

Question #29

Reference Q.295

For the following equation, what is $A'(2)$ if $u(2) = -1$ and $u'(2) = 2$ and $v(2) = 1$ and $v'(2) = -2$?

$A(x) = 2u(x) + 3(v(x))^2$

Question #30

Reference Q.296

For the following equation, what is $A'(x)$ if $u(2) = -1$ and $u'(2) = 2$ and $v(2) = 1$ and $v'(2) = -2$?

$A(x) = u(x)v(x)$

Question #31

Reference Q.297

For the following equation, what is $A'(2)$ if $u(2) = -1$ and $u'(2) = 2$ and $v(2) = 1$ and $v'(2) = -2$?

$A(x) = \frac{u(x)}{v(x)}$

Question #32

Reference Q.298

For $y = \frac{x-4}{3x^2-6}$, when is the tangent line parallel to the x-axis?

Question #33

Reference Q.299

For which x-value(s) is the tangent line to $y = \frac{x-4}{3x^2-6}$ perpendicular to the line $y = -x$?

Question #34: Proof: Derivative of a Constant Times a Function

Reference Q.64800

Prove $(cf(x))' = cf'(x)$(Hint: Use the definition of the derivative!)

Question #35: Proof: Derivative of a Constant Equals Zero

Reference Q.64803

Prove $\frac{d}{dx}c = 0$(Hint: Use the definition of the derivative!)

Question #36: Proof: Quotient Rule

Reference Q.64806

Prove $\left(\frac{f}{g}\right)' = \frac{f'g-fg'}{g^2}$ using Logarithmic Differentiation.

Question #37

Reference Q.300

Prove that $(fgh)' = f'gh + fg'h + fgh'$. (Hint, write fgh as a product of two functions and use the product rule... And you'll end up using it twice!)

Question #38

Reference Q.9136

Find $f'(x)$, where $f(x) = \frac{a(b+c)}{b}$, a, b, c are functions of x.

Question #39

Reference Q.9160

Let $f'(x) = \frac{g(x)}{x+2}$ and $g'(x) = x^2$. Find $f''(x)$

Question #40

Reference Q.9161

If $f(x) = \frac{\sqrt{2+x} + x^{\frac{2}{3}}}{x+2}$, what is the domain of $f'(x)$?