

1) $\frac{d}{dx} \left[\frac{a(x)}{b(x)} \right] = \frac{b(x)a'(x) - b'(x)a(x)}{[b(x)]^2}$ (The Quotient Rule)

2) Mean Value Theorem for Integrals

3) Since Simpson's Rule uses second degree polynomials to approximate the value of definite integrals, it yields exact values for all polynomials with degree less than 2

4) Definition of a critical number

5) Shell Method: $2\pi \int_a^b r(x)h(x)dx$, where $r(x) = x$ and $h(x) = 4x^2$

6) Continuity of a Composite Function Theorem

7) Mean Value Theorem

8) Definition of a point of inflection

9) Newton's Method for approximating zeros of a function

10) Theorem of Pappus states that the volume of the torus is the product of the area of the circle (πr^2) and the distance the center of the circle travels through ($2\pi(3r - r) = 4\pi^2 r^3$)

11) Use the product rule: $\frac{d}{dx}[uv] = uv' + vu' \Rightarrow$ after integrating $uv = \int u dv + \int v du \Rightarrow \int u dv = uv - \int v du$

12) Squeeze Theorem

13) Definition of the Derivative of a Function

14) Euler's Method

15) Definition of Exponential Growth and Decay Model

16) Definition of the General Power Rule

17) The area under $f(x)$ on the interval from a to b is $\int_a^b f(x)dx$. Since the area of the rectangle is equal to the area under the

function, the length of the side of the rectangle on the x -axis ($b-a$) is divided out \Rightarrow the area is $\frac{1}{b-a} \int_a^b f(x)dx$

18) Definition of chain rule, $b'(a(x))a'(x)$

19) This is an example of the washer method. The outer radius from the y -axis is 2, the distance of the outer boundary. The inner

boundary is the curve $y = 2x^2 + 2 \Rightarrow x = \sqrt{\frac{y-2}{2}}$. Thus the resulting volume with respect to y is $\pi \int_2^{10} \left(2^2 - \sqrt{\frac{y-2}{2}} \right) dy \Rightarrow$

$\pi \int_2^{10} \left(5 - \frac{y}{2} \right) dy$

20) Definition of Rolle's Theorem

21) Definition of Extreme Value Theorem

22) Definition of First Derivative Test

23) Definition of the Second fundamental theorem of calculus

24) This is an example of the disc method. The function in terms of y is $x = \sqrt{4-y}$. Thus the volume using the disc method is

$\pi \int_0^4 (4-y) dy$

25) Derivative of an Inverse Function

26) L'Hôpital's Rule can be applied to any of these indeterminate forms by transforming the limit.

27) General Power Rule for Integration

28) Definition of Extended Mean Value Theorem

29) Definition of fundamental theorem of calculus

30) Definition of Concavity