

BC Calculus

Test # 2 (1–60) Review

41. Graph: $y = \frac{-(x-1)^2(x^2+1)(x+4)}{(x+2)(x-3)^2(x-6)^3}$

42. Find $\frac{dy}{dx}$ if A) $y = \frac{x^2 + 3x + 2}{\ln x}$ B) $y = \frac{\sin x}{x}$

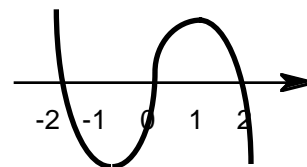
43. Find the exact area under $y = x^2 + 2$ on the interval $[0, 2]$ by using infinitely many upper rectangles.

44. A) Use the chain rule to find $\frac{dy}{dx}$ if $y = e^v$ and $v = \frac{1}{\sqrt{x}}$.

B) Evaluate: $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$

45. A) Sketch the graph of $f'(x)$ if the graph of $f(x)$ is as shown:

B) Sketch the graph of $f(x)$ if $f'(x) \begin{cases} < 0 & \text{when } x > 2 \\ < 0 & \text{when } x < 2 \\ = 0 & \text{when } x = 2 \end{cases}$



46. The base of a triangle remains constant at 8 inches while its height increases at a rate of $1/2$ inch/second. How fast is the area of the triangle changing when its height is 8 inches?

47. A) Find the area under $y = x^2 + 2$ on the interval $[2, 6]$.

B) Find the area under $y = e^x + 2x^{-1}$, to four decimal places, on the interval $[1, 3]$.

48. A) Write the derivatives of all six trig functions using complete sentences and then again using function notation.

B) Find $\frac{dy}{dx}$ if $y = \frac{\tan x}{\sec x}$.

49. Sketch a curve that has: A) positive slope and negative concavity.
 B) negative slope and positive concavity.
 C) negative slope and negative concavity.
 D) positive slope and positive concavity.

E) Use the second derivative test to classify all the extrema of $y = 2x^3 + 3x^2 - 36x + 6$.

50. Find $\frac{dy}{dx}$ if A) $y = e^{\sin(x^2+3x-4)}$ B) $y = e^{2x}(x^2+2)^{50}$

51. Integrate each of the following.

A) $\int 30x(3x^2 + 6)^4 dx$ B) $\int -4\cos^3 t \sin t dt$ C) $\int \frac{6x^2}{2\sqrt{2x^3 + 4}} dx$

D) $\int 4e^{4\sin x} \cos x dx$ E) $\int \frac{12x^3 + 3}{3x^4 + 3x} dx$

52. Farmer Pete has 300 feet of fence and wants to build a rectangular pen enclosed on 3 sides by the fence and on the fourth side by a wall of the barn. What dimensions should he use so that the pen has a maximum area?
53. Evaluate each of the following.
- A) $\int_{\sqrt{2}}^{\pi} (2^x - 2x + \pi) dx$ B) $\int_0^{e/2} \sin x^2 dx$
54. A) A particle is moving along the x axis so that its position is given by the equation $x(t) = 3t^2 - 4t + 6$. Find the position, velocity, and acceleration of the particle when $t = 4$.
- B) A ball is thrown vertically into the air so that its height above the ground at any time t is given by $h(t) = -4.9t^2 + 40t + 20$. What is the maximum height of the ball (including units)? How long does it take the ball to reach the ground (include units)? What is the greatest value of the acceleration of the ball (include units)?
55. A) Find the Maclaurin polynomial of $\ln(1 - x)$.
- B) Write the polynomial found in part (A) using summation notation.
- C) Use the first three terms of the polynomial you found in part (A) to estimate $\ln(1.1)$.
56. Integrate each of the following.
- A) $\int \sin(4t) dt$ B) $\int x(3x^2 + 2)^3 dx$ C) $\int \frac{x dx}{\sqrt{3x^2 + 2}}$
- D) $\int \sin^3(3t)\cos(3t) dt$ E) $\int e^{\cos(2t)} \sin(2t) dt$ F) $\int \frac{x^2 + 1}{x^3 + 3x} dx$
57. A) $\int_c^c f(x) dx =$ B) $\int_a^b f(x) dx = -\int_b^a f(x) dx$
- C) $\int_a^d f(x) dx + \int_d^c f(x) dx = \int_a^c f(x) dx$
- D) The maximum value of the integral $\int_3^7 f(x) dx$ is the maximum value of $f(x)$ on the interval $[3, 7]$ times _____.
- E) The minimum value of the integral $\int_3^7 f(x) dx$ is _____ times _____.
58. A) In order for the inverse of a function to be a function the original function must be _____ . This means that the original function must pass both the _____ and the _____ , or that it is always _____ or always _____.
- B) The graphs of inverses are always reflections of each other in _____.
- C) If a function contains the point (a, b) then its inverse must contain the point _____.
- D) Find $f^{-1}(4)$ if $f(x) = 3x - 6$.
59. A) Find the area of the region bounded by $y = x^3 + x^2 - 6x$ and the x axis.
- B) Find the area of the first quadrant region bounded by $y = x^2 - 4$, the x axis, and $x = 3$.
60. A) Find the area of the region bounded by $y = x^2$ and $y = x^4$.
- B) Find the area of the region which is between 0 and 2π and that is completely enclosed by only $y = \sin x$ and $y = \cos x$.