

Ch 6.4.2 # 3, 6, 9, 12, 15, 18, 27 - 34, 42

Find dx/dy

$$3. \ y = \int[0, x] (\sin^2 t) dt$$

$$dx/dy = \sin^2 x$$

$$4. \ y = \int[4, x] (e^u \sec u) du$$

$$dx/dy = e^x \sec x$$

$$5. \ y = \int[0, x^2] (e^{t^2}) dt$$

$$dx/dy = e^{x^4} \cdot du/dx$$

$$dx/dy = e^{x^4} \cdot 2x$$

$$dx/dy = 2x e^{x^4}$$

$$6. \ y = \int[\pi, \pi - x] ((1 + \sin^2 u) / (1 + \cos^2 u)) du$$

$$dx/dy = ((1 + \sin^2 (\pi - x)) / (1 + \cos^2 (\pi - x))) \cdot du/dx$$

$$dx/dy = ((1 + \sin^2 (\pi - x)) / (1 + \cos^2 (\pi - x))) \cdot x$$

$$dx/dy = x((1 + \sin^2 (\pi - x)) / (1 + \cos^2 (\pi - x)))$$

$$7. \ y = \int[x^3, 5] ((\cos t) / (t^2 + 2)) dt$$

$$dx/dy = - ((\cos x^3) / (x^5 + 2)) \cdot du/dx$$

$$dx/dy = - ((\cos x^3) / (x^5 + 2)) \cdot 3x^2$$

$$dx/dy = -3x^2 ((\cos x^3) / (x^5 + 2))$$

$$8. \ y = \int[3x^2, 5x] ((t^2 - 2t + 9) / (t^3 + 6)) dt$$

$$dx/dy = (((3x^2)^2 - 2(3x^2) + 9) / ((3x^2)^3 + 6)) \cdot du_1/dx - ((t^2 - 2t + 9) / (t^3 + 6)) \cdot du_2/dx$$

$$dx/dy = (((3x^2)^2 - 2(3x^2) + 9) / ((3x^2)^3 + 6)) \cdot 6x - ((t^2 - 2t + 9) / (t^3 + 6)) \cdot 5$$

$$dx/dy = (6x ((3x^2)^2 - 2(3x^2) + 9) / ((3x^2)^3 + 6)) - (5 (t^2 - 2t + 9) / (t^3 + 6))$$

Evaluate each integral using FTC 2; support with NINT if unsure

$$27. \ \int[1/2, 3] (2 - 1/x) dx$$

$$F(x) = 2x - \ln |x| + C$$

$$f = F(3) - F(1/2)$$

$$f = (2(3) - \ln |3|) - (2(1/2) - \ln |1/2|)$$

$$f = 3.208$$

$$28. \ \int[2, -1] (3^x) dx$$

$$F(x) = 3^x / \ln 3$$

$$f = F(-1) - F(2)$$

$$f = (3^{-1} / \ln (-1)) - (3^2 / \ln (2))$$

$$f = -12.98$$

$$29. \ \int[0, 1] (x^2 + \sqrt{x}) dx$$

$$F(x) = x^3/3 + 2x^{(3/2)}/3$$

$$f = F(1) - F(0)$$

$$f = ((1)^3/3 + 2(1)^{(3/2)}/3) - ((0)^3/3 + 2(0)^{(3/2)}/3)$$

$$f = 1$$

$$30. \int [0, 5] (x^{3/2}) dx$$

$$F(x) = 2x^{5/2}/5$$

$$\int = F(5) - F(0)$$

$$\int = (2(5)^{5/2}/5) - (2(0)^{5/2}/5)$$

$$\int = 22.36$$

$$31. \int [1, 32] (x^{-6/5}) dx$$

$$F(x) = -5/x^{1/5}$$

$$\int = F(32) - F(1)$$

$$\int = (-5/(32)^{1/5}) - (-5/(1)^{1/5})$$

$$\int = 5/2$$

$$32. \int [-2, -1] (2/x^2) dx$$

$$F(x) = -2/x$$

$$\int = F(-1) - F(-2)$$

$$\int = (-2/-1) - (-2/-2)$$

$$\int = 1$$

$$33. \int [0, \pi] (\sin x) dx$$

$$F(x) = -\cos x$$

$$\int = F(\pi) - F(0)$$

$$\int = (-\cos \pi) - (-\cos 0)$$

$$\int = 2$$

$$34. \int [0, \pi] (1 + \cos x) dx$$

$$F(x) = x + \sin x$$

$$\int = F(\pi) - F(0)$$

$$\int = (\pi + \sin \pi) - (0 + \sin 0)$$

$$\int = \pi$$

Find total area of region between curve and x-axis

$$42. y = 3x^2 - 3, [-2, 2]$$

$$F(x) = x^3 - 3x$$

$$-\int [-1, 1] (3x^2 - 3) dx$$

$$-\int = F(1) - F(-1)$$

$$-\int = ((1)^3 - 3(1)) - ((-1)^3 - 3(-1))$$

$$\int = 4$$

$$2\int [1, 2] (3x^2 - 3) dx$$

$$\int = F(2) - F(1)$$

$$\int = ((2)^3 - 3(2)) - ((1)^3 - 3(1))$$

$$\int = 8$$

$$\text{total area} = 12$$