BC Calc

3.3 Pg 124 #1-19 odd, 23-33 odd, 41, 47

(1) $y' = -2x$

(3) $\frac{dy}{dx} = 2$

(5) $\frac{dy}{dx} = x^2 + x + 1$

(7) $\frac{dy}{dx} = 3x^2 - 4x + 1$

$3x^2 - 4x + 1 = 0$

$(3x - 1)(x - 1)$

$x = \frac{1}{3}, \quad x = 1$

(9) $\frac{dy}{dx} = 4x^3 - 8x$

$4x(x^2 - 2) = 0$

$x = 0, \quad x = \pm\sqrt{2}$

(11) $\frac{dy}{dx} = 15x^2 - 15x^4$

$15x^2(1 - x^2) = 0$

$x = 0, \quad x = \pm 1$

(13) a) $\frac{dy}{dx} = 1(x^2+1) + 2x(x+1)$

$= 3x^2 + 2x + 1$

b) $y = x^3 + x^2 + x + 1$

$\frac{dy}{dx} = 3x^2 + 2x + 1$

(15) $\frac{dy}{dx} = (4x^3+2x)(x^3+x+1) + (3x^2+1)(x^4+x^2+1)$

(17) $\frac{dy}{dx} = \frac{2(3x-2) - 3(2x+5)}{(3x-2)^2}$

$= \frac{-19}{(3x-2)^2}$

(19) $y = \frac{(x-1)(x^2+x+1)}{x^3}$

$y = \frac{x^3 + x^2 + x - x^2 - x - 1}{x^3}$

$y = \frac{x^3 - 1}{x^3} = 1 - x^{-3}$

$y' = 3x^{-4} = \frac{3}{x^4}$

⇒

(23)

a) $\frac{d}{dx}(uv) = uv' + u'v$

$= 5 \cdot 2 + -3 \cdot -1$

$= 13$

b) $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{vu' - uv'}{v^2}$

$= \frac{-1 \cdot -3 - 5 \cdot 2}{(-1)^2}$

$= -7$

c) $\frac{d}{dx}\left(\frac{v}{u}\right) = \frac{uv' - vu'}{u^2}$

$= \frac{5 \cdot 2 - -1 \cdot -3}{5^2}$

$= \frac{7}{25}$

d) $\frac{d}{dx}(7v - 2u)$

$7v' - 2u' = 7(2) - 2(-3)$

$= 20$

(25) $\left.\frac{dy}{dx}\right|_{x=3} = 2(3) + 5 = 11$

(27) $y = \frac{x^3 + 1}{2x} = \frac{1}{2}x^2 + (2x)^{-1}$

$y(1) = 1$

$y' = x - \frac{2}{(2x)^2}$

$y'(1) = 1 - \frac{1}{2} = \frac{1}{2}$

$y - 1 = \frac{1}{2}(x - 1)$

(29) $\frac{dy}{dx} = -8x^{-3} - 8$

(31) $y = \frac{\sqrt{x} - 1}{\sqrt{x} + 1}$

$\frac{dy}{dx} = \frac{\frac{1}{2\sqrt{x}}(\sqrt{x} + 1) - \frac{1}{2\sqrt{x}}(\sqrt{x} - 1)}{(\sqrt{x} + 1)^2}$

$= \frac{\frac{1}{2} + \frac{1}{2\sqrt{x}} - \frac{1}{2} + \frac{1}{2\sqrt{x}}}{(\sqrt{x} + 1)^2}$

$= \frac{\frac{1}{\sqrt{x}}}{(\sqrt{x} + 1)^2}$

$= \frac{1}{\sqrt{x}(\sqrt{x} + 1)^2}$

(33) $y = x^4 + x^3 - 2x^2 + x - 5$

$y' = 4x^3 + 3x^2 - 4x + 1$

$y'' = 12x^2 + 6x - 4$

$y''' = 24x + 6$

$y^{IV} = 24$

(41) $y = \dfrac{4x}{x^2+1}$

$$\frac{dy}{dx} = \frac{4(x^2+1) - 2x \cdot 4x}{(x^2+1)^2}$$

$$= \frac{4 - 4x^2}{(x^2+1)^2}$$

at $(0,0)$: $y = 4x$

at $(1,2)$: $y = 2$

(47) $s = 4.9\,t^2$

$$\frac{ds}{dt} = 9.8\,t$$

$$\frac{d^2s}{dt^2} = 9.8$$