

3.2 # 3, 7, 9, 13, 15, 19, 21, 25, 27, 31, 33, 39, 43, 51, 53 Solutions

$$\begin{aligned}
 3) f(x) &= x^3 \\
 f'(x) &= \lim_{h \rightarrow 0} \frac{(x+h)^3 - x^3}{h} \\
 &= \lim_{h \rightarrow 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 - x^3}{h} \\
 &= \lim_{h \rightarrow 0} \frac{3x^2h + 3xh^2 + h^3}{h} \\
 &= \lim_{h \rightarrow 0} 3x^2 + 3xh + h^2 \\
 &= 3x^2
 \end{aligned}$$

$$\begin{aligned}
 7) \frac{d}{dx} x^4 \Big|_{x=-2} &= 4x^3 \Big|_{x=-2} \\
 &= 4(-2)^3 \\
 &= 4(-8) \\
 &= -32
 \end{aligned}$$

$$\begin{aligned}
 9) \frac{d}{dt} t^{2/3} \Big|_{t=8} &= \frac{2}{3} t^{-1/3} \Big|_{t=8} \\
 &= \frac{2}{3} (8)^{-1/3} \\
 &= \frac{2}{3} \left(\frac{1}{\sqrt[3]{8}}\right) \\
 &= \frac{2}{3} \left(\frac{1}{2}\right) \\
 &= \frac{1}{3}
 \end{aligned}$$

$$13) \frac{d}{dt} t^{\sqrt{7}} = \sqrt{7} t^{\sqrt{7}-1}$$

$$\begin{aligned}
 15) f'(x) &= 4x^3 \\
 f'(2) &= 4(2)^3 = 4(8) = 32 \\
 y - 16 &= 32(x - 2)
 \end{aligned}$$

$$\begin{aligned}
 19) y &= \frac{1}{\sqrt{x}} \quad y = x^{-1/2} \\
 y' &= -\frac{1}{2} x^{-3/2} \\
 y'(9) &= -\frac{1}{2} (9)^{-3/2} \\
 &= -\frac{1}{2} \left(\frac{1}{9}\right)^{3/2} \\
 &= -\frac{1}{2} \left(\frac{1}{27}\right) \\
 &= -\frac{1}{54}
 \end{aligned}$$

$$y - \frac{1}{3} = -\frac{1}{54}(x - 9)$$

$$21) f'(x) = 6x^2 - 6x$$

$$\begin{aligned}
 \star 25) g'(z) &= 7\left(\frac{5}{14}\right) z^{-19/4} - 5z^{-6} \\
 &= -\frac{5}{2} z^{-19/4} - 5z^{-6}
 \end{aligned}$$

$$\begin{aligned}
 27) f(s) &= s^{1/4} + s^{1/3} \\
 f'(s) &= \frac{1}{4} s^{-3/4} + \frac{1}{3} s^{-2/3}
 \end{aligned}$$

$$\begin{aligned}
 31) h'(t) &= (\sqrt{2})\sqrt{2} t^{\sqrt{2}-1} \\
 &= 2 t^{\sqrt{2}-1}
 \end{aligned}$$

$$\begin{aligned}
 33) p(s) &= (4s - 3)^2 \\
 &= (4s)^2 - 24s - 9 \\
 &= 16s^2 - 24s - 9 \\
 p'(s) &= 32s - 24
 \end{aligned}$$

$$\begin{aligned}
 39) \frac{ds}{dz} \Big|_{z=2} \quad s &= 4z - 16z^2 \\
 &= (4 - 32z) \Big|_{z=2} \\
 &= 4 - 32(2) \\
 &= 4 - 64 \\
 &= -60
 \end{aligned}$$

$$\begin{aligned}
 43) A &\rightarrow \text{III} \\
 B &\rightarrow \text{I} \\
 C &\rightarrow \text{II} \\
 D &\rightarrow \text{III}
 \end{aligned}$$

$$\begin{aligned}
 51) y' &= 2x + 3 \\
 2x + 3 &= 4 \\
 \underline{-3 \quad -3} \\
 2x &= 1 \\
 \underline{2 \quad 2} \\
 x &= \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 53) p'(x) &= 2x + a & p(x) &= x^2 + 2x + b \\
 4 &= 2(1) + a & 0 &= (1)^2 + 2(1) + b \\
 4 &= 2 + a & 0 &= 1 + 2 + b \\
 a &= 2 & 0 &= 3 + b \\
 & & b &= -3
 \end{aligned}$$

$$p(x) = x^2 + 2x - 3$$