2.5 Exercises

4. $f(x) = 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4$

$f'(x) = \frac{d}{dx}\left(1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4\right)$

$f'(x) = 0 + 1 + \frac{1}{2} \times 2x + \frac{1}{6} \times 3x^2 + \frac{1}{24} \times 4x^3$

$f'(x) = 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3$

16. $f(x) = \frac{32}{\sqrt[4]{x}}$

$f(x) = \left(\frac{32}{x^{\frac{1}{4}}}\right)$

$f'(x) = -32 \cdot \frac{\frac{1}{4}}{\left(x^{\frac{1}{4}}\right)^2}$

$f'(x) = -32 \cdot \frac{\frac{1}{4}x^{-\frac{3}{4}}}{\left(x^{\frac{1}{4}}\right)^2}$

$f'(x) = -\frac{8}{x^{\frac{1}{4}} \cdot x^{\frac{1}{2}}}$

20. $\frac{d^3}{dr^3}\left(\frac{4}{3}\pi r^3\right)$

$\left(\frac{d}{dr}\left(\frac{4}{3}\pi r^3\right)\right)$

$\left(\frac{d}{dr}\left(4\pi r^2\right)\right)$

$\left(\frac{d}{dr}\left(8\pi r\right)\right)$

8π

28. $(x^3 + x - 1)(x^3 + 1)$

$x^3(x^3 + 1) + x(x^3 + 1) - 1(x^3 + 1)$

$x^6 + x^3 + x^4 + x - x^3 - 1$

$x^6 + x^4 + x - 1$

36. $s(t) = 16t + 100$

$v(t) = s'(t) = 16$

40. $T(t) = 98 + 8y^{\frac{1}{4}}$

$T(2) = 98 + 8y(2)^{\frac{1}{4}} = 98 + 16$

$114°F$

44. $P(x) = 5.27x^{0.3} - 0.463x^{1.32}$

$P'(x) = 1.581x^{(0.3)-1} - 0.611x^{0.52}$

$P''(x) = -1.107x^{(-1.7)} + 0.361x^{(-0.48)}$

$P(3) \approx 3.20$ mg

$P'(3) \approx 0.453$ mg/y

$P''(3) \approx 0.317$ mg/y^2

48. $P(t)$ represents a quantity that is increasing over time.

52.

a) $P'(1)$ is negative & $P''(1)$ is positive

b) $P(50)$ is undetermined & $P'(50)$ is negative