Section 3.4

14. $\pi t\cos(\pi t)+\sin(\pi t)$ **22.** $5\left(x+\dfrac{1}{x}\right)^4\left(1-\dfrac{1}{x^2}\right)$

62. $h'(x)=\dfrac{3f'(x)}{2\sqrt{4+3f(x)}}$ and $h'(1)=\dfrac{6}{5}$.

Section 3.5

12. $y'=-\dfrac{y\,\sin(xy)}{x\,\sin(xy)+\cos y}$ **10.** $y'=\dfrac{1-e^y}{xe^y+1}$

26. $y'=\dfrac{2-\cos(x+y)}{\cos(x+y)+2}$ and the tangent line is $y=\dfrac{1}{3}x+\dfrac{2\pi}{3}$

52. $-\dfrac{1}{2\sqrt{x}\sqrt{1-x}}$ **56.** $-\dfrac{1}{|t|\sqrt{t^2-1}}$

Section 3.6

4. $2\cot x$

42. $y'=\sqrt{x}\,e^{x^2-x}\,(1+x)^{2/3}\left(\dfrac{1}{2x}+2x-1+\dfrac{2}{3x+3}\right)$

Section 3.7

2. **(a)** $\mathbf{v}(t)=-\dfrac{9(t^2-9)}{(t^2+9)^2}$, **(b)** $\mathbf{v}(1)=\frac{18}{25}$ ft/s, **(c)** $t=3\,\text{s}$, **(d)** $0<t<3$,

(e) total distance is $\dfrac{9}{5}$ ft, **(g)** $\mathbf{a}(t)=\dfrac{18t(t^2-27)}{(t^2+9)^3}$, $\mathbf{a}(1)=-\frac{117}{250}$ ft/s^2,

(i) At both $t=1/3$ and $t=4/3$ particle is moving forward and slowing down.

3. **(i)** At $t=1/3$ particle is moving forward and slowing down and at $t=4/3$ it is moving backward and speeding up.

4. **(a)** $\mathbf{v}(t)=t(2-t)e^{-t}$, **(b)** $\mathbf{v}(1)=\frac{1}{e}$ ft/s, **(c)** At $t=0\,\text{s}$ or $t=2\,\text{s}$, **(d)** $0<t<2$,

(e) total distance is $\left(\dfrac{8}{e^2}-\dfrac{36}{e^6}\right)ft$, **(g)** $\mathbf{a}(t)=(t^2-4t+2)e^{-t}$, $\mathbf{a}(1)=-\frac{1}{e}$ ft/s^2,

(i) At $t=1/3$ particle is moving forward and speeding up and at $t=4/3$ particle is moving forward but slowing down.

Section 3.9

4. $140cm^2/s$ **6.** $25,600\pi\ mm^3/s$ **14.** (a) $-1\,cm^2/s$ (b) If x is the diameter we will find dx/dt when $x=10$ (c) $2\pi\,x\dfrac{dx}{dt}$ (d) $\dfrac{dx}{dt}=-\dfrac{1}{20\pi}\,cm/min$

Chapter 3 Review:

4. $y'=\dfrac{(1+\cos x)\sec^2 x+\tan x\,\sin x}{(1+\cos x)^2}$ **12.** $y'=\dfrac{4\ \arcsin 2x}{\sqrt{1-4x^2}}$

72. $y'=2x\,g'(x^2)$ **78.** $y'=\dfrac{g'(\ln x)}{x}$

Section 4.1

60. Absolute maxima is $f(1) = \sqrt{e}$ and absolute minima is $f(-2) = -2/e$

Section 4.2

8. $f(x) = x + 1/x$, $\left[\frac{1}{2}, 2\right]$. $f'(x) = 1 - 1/x^2 = \dfrac{x^2-1}{x^2}$. f is a rational function that is continuous on its domain, $(-\infty, 0) \cup (0, \infty)$, so it is continuous on $\left[\frac{1}{2}, 2\right]$. f' has the same domain and is differentiable on $\left(\frac{1}{2}, 2\right)$. Also, $f\left(\frac{1}{2}\right) = \frac{5}{2} = f(2)$. $f'(c) = 0 \Leftrightarrow \dfrac{c^2-1}{c^2} = 0 \Leftrightarrow c^2 - 1 = 0 \Leftrightarrow c = \pm 1$. Only 1 is in $\left(\frac{1}{2}, 2\right)$, so 1 satisfies the conclusion of Rolle's Theorem.

14. $f(x) = \dfrac{1}{x}$, $[1, 3]$. f is continuous and differentiable on $(-\infty, 0) \cup (0, \infty)$, so f is continous on $[1, 3]$ and differentiable on $(1, 3)$. $f'(c) = \dfrac{f(b) - f(a)}{b - a} \Leftrightarrow -\dfrac{1}{c^2} = \dfrac{f(3) - f(1)}{3 - 1} = \dfrac{\frac{1}{3} - 1}{2} = -\dfrac{1}{3} \Leftrightarrow c^2 = 3 \Leftrightarrow c = \pm\sqrt{3}$, but only $\sqrt{3}$ is in $(1, 3)$.

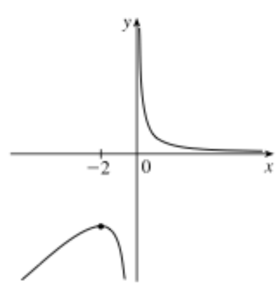
Section 4.3

18. (a) f is increasing on $(0, 4)$ and decreasing on $(-\infty, 0) \cup (4, \infty)$.

(b) Local minimum value is $f(0) = 0$ and local maximum value is $f(4) = \dfrac{256}{e^4}$.

(c) f is concaved up on $(-\infty, 2) \cup (6, \infty)$ and concaved down on $(2, 6)$.
Inflection points are $(2, 16e^{-2})$ and $(6, 1296e^{-6})$.

26.

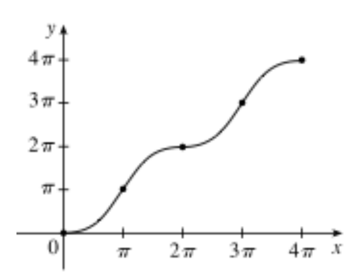


48. **(a)** S is increasing on $(0, 4\pi)$ and never decrease.

(b) No local minimum or local maximum.

(c) S is concave upward on $(o, \pi) \cup (2\pi, 3\pi)$
and concave downward on $(\pi, 2\pi) \cup (3\pi, 4\pi)$.
Inflection points are (π, π), $(2\pi, 2\pi)$, and $(3\pi, 3\pi)$.

(d)



Section 4.4

40. 2

Section 4.9

12. $\frac{3}{5}x^{5/3} + \frac{2}{5}x^{5/2} + C$ **16.** $R(\theta) = \sec\theta - 2e^{\theta} + C$ **18.** $G(v) = 2\sin v - 3\arcsin v + C$

20. $x - 2\cos x + 6\sqrt{x} + C$

Chapter 4 Review

6: Critical numbers are $x = 0,\ 2$. Local minimum value is $f(0) = 0$ and local maximum value is $f(2) = \frac{4}{e^2}$. Absolute minimum value is $f(0) = 0$ and absolute maximum value is $f(-1) = e$.

8. $\frac{4}{3}$ **10.** ∞