OUTCOME 7 DAY 1 & 2 ASSIGNMENT (Solutions p 32)

(Section 8.3 & 8.4 in Text)

Day 1 Assignment:

- ***Review Questions from PC 30 1a-h, 2acegjl, 3acegik, 5a (Do as many as you need – you will need to know and use all this info)***
- **New Questions: 1ijkln, 2bdfhi, 3bdh, 4abcdefgj, 5bcd, 6acd, 7**

Day 2 Assignment : 8acfijlmoq, 9abcefghijkl, 12, 15

1. By inspection, evaluate each of the following logarithms.

(a) $\log_9 81$ (b) $\log_3 81$ (c) $\log 1000$ (d) $\log_2\left(\frac{1}{4}\right)$ (e) $\log_7 7$ (f) $\log_6 1$ (g) $\log_8 8^{13}$

(h) $\log_{11} 11^{-20}$ (i) $\ln 1$ (j) $\ln e$ (k) $\ln e^5$ (l) $\ln e^{-7}$ (m) $\ln\left(\frac{1}{e}\right)$ (n) $\ln\left(\frac{1}{e^3}\right)$

2. Use log properties to rewrite each expression as the logarithm of a single quantity. That is, each of your answers should look like $\log_b \square$ or $\ln \square$. You do not have to evaluate the logarithm.

(a) $\log_3 12 + \log_3 10$ (b) $\ln 50 - \ln 5$ (c) $2\log_3 11$

(d) $-2\ln 3$ (e) $\log_9 6 + \log_9 7 - \log_9 21$ (f) $\ln 3 + \ln 4 + \ln 5 - \ln 6$

(g) $3\log_5 4 - 4\log_5 2$ (h) $5\ln 2 - 2\ln 4$ (i) $\ln 12 - \ln 6 - \ln 2 - \ln 3$

(j) $3\log_{14} a - \log_{14} b - \log_{14} c$ (k) $-2\ln t + 5\ln w - \ln r + 3\ln s$ (l) $\frac{2}{3}\log_7 x - \frac{3}{4}\log_7 y$

3. Use properties of logarithms to expand each of the following.

(a) $\log_2\left(x^{10}\right)$ (b) $\ln y^{-7}$ (c) $\log_3 \sqrt{x}$ (d) $\ln \sqrt[5]{x}$

(e) $\log_6\left(\frac{1}{x^3}\right)$ (f) $\ln \sqrt[5]{x^4}$ (g) $\log_5\left(\frac{x+2}{x-2}\right)$ (h) $\ln\left[\frac{x}{(x+1)(x+2)}\right]$

(i) $\log_8\left[x^3(x+2)\right]$ (j) $\ln\left[\sqrt{x+1}(2x-1)\right]$ (k) $\log_3\sqrt{\frac{x}{x+4}}$ (l) $\ln\sqrt[3]{\frac{x^2}{2x+1}}$

4. Use your calculator to find the value of each of the following, correct to 5 decimal places.

(a) $8\log 12$ (b) $\ln 603$ (c) $\log_3 603$ (d) $\log_3 e$ (e) $-3\ln 50$

(f) $\log_7\left(\frac{5}{8}\right)$ (g) $\ln\left(\frac{1}{20}\right)$ (h) e^3 (i) $\frac{3\pi}{e}$ (j) $\ln\left(\frac{e^3}{\pi}\right)$

5. Solve for x.
   (a) $\log_5 x = 3$ (b) $\ln x = 1$ (c) $\ln(x-1) = 2$ (d) $\ln(2x)+1 = 0$

6. Find the slope of the tangent line to the given curve at the point with the given x-coordinate. Round your answer to five decimal places where necessary.
   (a) $y = \log_2 x$; $x = 4$ (b) $y = \log_5 x$; $x = 0.5$ (c) $y = \log x$; $x = 10$ (d) $y = \log_3 \sqrt{x}$; $x = 9$
   (e) $y = \ln x$; $x = 4$ (f) $y = \ln x$; $x = 0.5$ (g) $y = \ln x$; $x = 10$ (h) $y = \ln \sqrt{x}$; $x = 9$

7. Find the derivative of each of the following functions. You may leave expressions of the form $\log_b e$ in your answer.
   (a) $y = \log_4(5x+6)$ (b) $y = 8\log_6(x^2-5x)$ (c) $y = \log\left(\frac{x-1}{x+1}\right)$ (d) $y = \log_{12}(2x^3+5)^{10}$

8. Find the derivative of each of the following functions. You may want to use log properties to simplify some of the questions prior to differentiation.
   (a) $f(x) = \ln(5x)$ (b) $f(x) = \ln(2\pi x)$ (c) $f(x) = 6\ln(4x)$
   (d) $f(x) = -2\ln(10x)$ (e) $f(x) = \frac{3}{4}\ln\left(\frac{2x}{3}\right)$ (f) $f(x) = 4\ln(2x+7)$
   (g) $f(x) = -2\ln(6-5x)$ (h) $f(x) = 2\ln(x^4)$ (i) $f(x) = \frac{1}{3}\ln(x^{-3})$
   (j) $f(x) = 5\ln(x^2+5x+3)$ (k) $f(x) = -2\ln\sqrt{x+3}$ (l) $f(x) = -3\ln\sqrt[3]{x^3+1}$
   (m) $f(x) = \ln(6x-1)^{2/3}$ (n) $f(x) = \ln(3x^2+4)^{-1/4}$ (o) $f(x) = \ln[(x-2)(3x+1)]$
   (p) $f(x) = \ln\left[(x^5)\sqrt{x-1}\right]$ (q) $f(x) = \ln\left(\frac{3x^3}{x^2+4}\right)$ (r) $f(x) = \ln\left(\frac{x+6}{2x-1}\right)$

9. Find the derivative of each of the following functions.
   (a) $f(x) = x^3 \ln x$ (b) $f(x) = (x^2-4)\ln x$ (c) $f(x) = \frac{2x}{\ln x}$
   (d) $f(x) = (x^2-1)\ln(x+1)$ (e) $f(x) = 2x^3\ln(1-x^3)$ (f) $f(x) = (x-1)^4\ln\left[(x-1)^4\right]$
   (g) $f(x) = 2\left[\ln(3x^2+8)\right]^6$ (h) $f(x) = 2\ln\left[(3x^2+8)^6\right]$ (i) $f(x) = \ln 6$
   (j) $f(x) = (\ln e)x$ (k) $f(x) = 2\ln(\ln x)$ (l) $f(x) = 5\ln[2\ln(3x+1)]$

10. If $x^2+y^2+\ln(xy) = 5$, use implicit differentiation to show that $\frac{dy}{dx} = \frac{-y(2x^2+1)}{x(2y^2+1)}$.

11. Show that the fifth derivative of $f(x) = \ln(2x-1)$ is $\frac{768}{(2x-1)^5}$.

12. Find the equation of the tangent line drawn to the curve $f(x) = 2x + \ln x$ at the point where $x = 1$.

13. Find the equation of the tangent line drawn to the curve $f(x) = x\ln x$ at the point where $x = e$.

14. Determine the open increasing and decreasing interval(s) and the coordinates of any relative extrema for each function.
   (a) $f(x) = \ln x - \frac{1}{2}x$ (b) $f(x) = x^2 - 8\ln x$

15. Find the open interval(s) in which the graph of the function $f(x) = x(\ln x)^2$ is concave up and concave down.

OUTCOME 7 DAY 3 ASSIGNMENT (Solutions p 33)

2odd, 4a, 5a, 6, 9, 14, 15, 17, 19, 21, 23, 25, 27, 28, 30, 31, 32, 35, 36, 38

Note: This is Section 8.3 & 8.4 in Text

1. Use your calculator to evaluate each of the following to five decimal places.
   (a) e^4 (b) $250e$ (c) $e^3 - e^2$ (d) $4\sqrt{e}$
   (e) $e^{-1} + e^{-2}$ (f) $4(e-2)^4$ (g) $5^3 \ln 5$ (h) $3\left(7^2\right)\ln 7$
2. Evaluate each of the following without using your calculator.
   (a) $e^{\ln 23}$ (b) $23^{\log_{23} 4}$ (c) $\log_8 8^{-7}$ (d) $\ln e^{1/4}$
   (e) $5^{-2\log_5 3}$ (f) $e^{4\ln 3}$ (g) $4\ln e^{-3}$ (h) $-2\log_3 3^{-1}$
3. Starting with the graph of $y = e^x$, explain the transformation you would apply in order to draw the graph of each of the following functions.
   (a) $y = e^{-x}$ (b) $y = -e^x$ (c) $y = e^x + 3$ (d) $y = e^x - 2$ (e) $y = e^{x-5}$
   (f) $y = e^{x+1}$ (g) $y = 2e^x$ (h) $y = \dfrac{e^x}{3}$ (i) $y = e^{x/2}$ (j) $y = e^{2x}$
4. Find the slope of the tangent line to the graph of each function at the given value of x. Round your answer to 5 decimal places.
   (a) $y = 4^x$; $x = 1$ (b) $y = (1/2)^x$; $x = 2$ (c) $y = e^{3x}$; $x = -1.5$ (d) $y = xe^x$; $x = -2$
5. Find the derivative of each of the following functions. Leave expressions of the form $\ln b$ in your answers.
   (a) $y = 7^x$ (b) $y = 3^{2x+5}$ (c) $y = (2/3)^{x^3-4x}$ (d) $y = 4\left(2^{x^3}\right)$
   (e) $y = 6\left(5^{-3x}\right)$ (f) $y = \left(2x^4\right)\left(5^{3-x}\right)$ (g) $y = \dfrac{3^x}{x^2}$ (h) $y = \left(2^x\right)\left(3^{x^2}\right)$

6. $y = e^{8x}$
7. $y = e^{-4x}$
8. $y = 3e^{5x}$
9. $y = -2e^{-4x}$
10. $y = 6e^{2-x^2}$
11. $y = e^{x^2-5x+6}$
12. $y = e^{-2x^3}$
13. $y = 10e^{4x-2x^2}$
14. $y = e^{(x-4)^3}$
15. $y = -5e^{-(3x+1)^2}$
16. $y = e^{2/x}$
17. $y = 11e^{-4/x^2}$
18. $y = e^{4/(x+3)}$
19. $y = 9e^{-2/\left(x^3+4\right)}$
20. $y = e^{\ln 7x}$
21. $y = e^{\ln\left(2x^3-x^2\right)}$
22. $y = e^{4\ln x}$
23. $y = e^{-3\ln(2x-1)}$
24. $y = xe^x$
25. $y = 2x^2e^x$
26. $y = (x+2)e^{2x}$
27. $y = (x+2)e^{(x+2)^2}$
28. $y = \left(2x^3+3\right)e^{2x^3+3}$
29. $y = \dfrac{x}{e^x}$
30. $y = \dfrac{e^{2x}}{2x^3}$
31. $y = \dfrac{e^{4x+3}}{4x+3}$
32. $y = 6e^{\sqrt{x}}$
33. $y = -4e^{\sqrt[4]{x^3}}$
34. $y = \pi x e^{\pi x}$
35. $y = \dfrac{1}{3}x^3e^{\ln 6x}$
36. $y = \sqrt{x}e^{(\ln x)/2}$
37. $y = \dfrac{e^{3x-1}}{2x+1}$
38. $y = e^{16}$
39. $y = e^3x^3$
40. $y = \left(e^{2x}\right)\left(e^{3x}\right)$
41. $y = \left(e^{6x-5}\right)^{10}$
42. $y = \ln\left(e^{3x}+2\right)$
43. $y = e^x \ln x$
44. $y = \ln\left(\dfrac{e^x+1}{e^x-1}\right)$
45. $y = x\ln\left(xe^x\right)$

46. Find an expression for the 50th derivative of the function $f(x) = e^{2x}$.

47. If $e^{x+y} + xy = 40$, use implicit differentiation to show that $\dfrac{dy}{dx} = \dfrac{-y-e^{x+y}}{x+e^{x+y}}$.

48. Find the equation of the line tangent to the curve $f(x) = xe^x$ at $x = 1$. Leave e in your answer.

49. Find the equation of the line tangent to the curve $f(x) = \dfrac{e^x}{x-1}$ at $x = 2$. Leave e in your answer.

50. For the function $f(x) = x^2 e^x$, find:
    (a) the open interval(s) on which the function is increasing or decreasing.
    (b) the coordinates of any relative extrema.

51. For the function $f(x) = xe^x$, find:
    (a) the open intervals on which the function is concave up or concave down.
    (b) the coordinates of any inflection points.

OUTCOME 7 REVIEW ASSIGNMENT (Solutions p 34)

1. Evaluate each of the following limits.

(a) $\lim\limits_{x\to 0} \dfrac{6x}{\sin x}$ (b) $\lim\limits_{x\to 0} \dfrac{\cos x - 1}{x}$ (c) $\lim\limits_{x\to 0} \dfrac{\sin 9x}{\sin 7x}$ (d) $\lim\limits_{x\to 0} \dfrac{\sin^2 x}{x}$

(e) $\lim\limits_{x\to 0} \dfrac{\tan 4x}{\sin 3x}$ (f) $\lim\limits_{x\to 0} \dfrac{\sin 3x}{4 - \cos^2 x}$ (g) $\lim\limits_{x\to 0} \dfrac{2x^2}{\tan^2 x}$ (h) $\lim\limits_{x\to 2} \dfrac{x^2 - x - 2}{\sin(x-2)}$

2. In the interval $[-1,1]$, $2 + \sin x \le f(x) \le e^x + 1$. Find $\lim\limits_{x\to 0} f(x)$.

3. Find the derivative of each of the following functions. Simplify your answer.

(a) $y = 21x^{10}$ (b) $y = 6\cos 3x$ (c) $y = \dfrac{1}{5}\sin 20x$ (d) $y = 2e^{3x}$

(e) $y = \ln(x^2 + 5x)$ (f) $y = \log_5(\sin x)$ (g) $y = 10^x$ (h) $y = e^{\ln(x^4)}$

(i) $y = e^{-x^3}$ (j) $y = 5\ln 10x$ (k) $y = \cos(\ln 2x)$ (l) $y = xe^{2x}$

(m) $y = x^2 \sin 2x$ (n) $y = (e^x)^{20}$ (o) $y = \ln(\cos 3x)$ (p) $y = -3\sin\left(\dfrac{x}{3}\right)$

(q) $y = e^{-2\ln x}$ (r) $y = \dfrac{1}{15}\cos^{30} x$ (s) $y = 5^{x^3}$ (t) $y = \log e$

(u) $y = \log x$ (v) $y = \ln\left(\dfrac{x}{x-1}\right)$ (w) $y = \ln\left[\sin\left(2e^{6x}\right)\right]$ (x) $y = 4\left(e^{3x+1}\right)^2$

4. Find the derivative of each of the following functions. **Do not simplify your answer.** Stop after your first line of differentiation.

(a) $y=\sqrt{x-5}\ln\left(\sqrt{x-5}\right)$ (b) $y=\left[\ln\left(x^2+1\right)\right]^3$ (c) $y=\dfrac{\sin 3x}{e^{\left(x^2+1\right)^5}}$

(d) $y=5x\cos^3 2x$ (e) $y=\sin^2 x+\sin x^2$ (f) $y=\cos\left[\sin\left(\cos x\right)\right]$

5. Use implicit differentiation to find $\dfrac{dy}{dx}$ if $x=3y+\sin y$.

6. Find the value of x, in the interval $(0,\pi)$, at which the tangent line to the curve $f(x)=\sin 2x-2\sin x$ is horizontal. It will be helpful to use the identity $\cos 2x=2\cos^2 x-1$ at some point in your solution.

7. Find the equation of the function obtained by reflecting the graph of $y=e^x$ about the y-axis and then shifting it 3 units downwards and 2 units to the left.

8. Find the y-intercept of the tangent line drawn to the curve $f(x)=\sqrt[3]{8x^3+3\ln x}$ at the point $(1,2)$.

9. If $f(x)=x^4\ln x$, find $f''(x)$.

10. Find the coordinates of any relative extrema for the function $f(x)=e^x-ex-2$.

11. Find the x-intercept of the tangent line drawn to the curve $f(x)=e^x$ drawn at the point $(2,f(2))$.

12. Find the slope of the tangent line drawn to the curve $\sin(x+y)=2y\cos x$ at the point $(0,0)$.

13. Consider the function $f(x)=(x-4)e^x$.

(a) Find $f'(x)$ and $f''(x)$.

(b) Determine the open intervals in which $f(x)$ is increasing or decreasing.

(c) Determine the coordinates of any relative extrema.

(d) Determine the open intervals in which $f(x)$ is concave up or concave down.

(e) Determine the coordinates of any inflection points.

14. Use your calculator to find each of the following correct to 5 decimal places.

(a) $e^2-e^{-1}+1$ (b) $3\ln 5$ (c) $\log_4 9$ (d) $f'(4)$ if $f(x)=\cos x$ (e) $f'(0.3)$ if $f(x)=\log_6 x$

CALCULUS 30: SOLUTIONS TO WORKBOOK ASSIGNMENTS

SOLUTIONS TO: OUTCOME 7 DAY 1 & 2 ASSIGNMENT

1. **(a)** 2 **(b)** 4 **(c)** 3 **(d)** -2 **(e)** 1 **(f)** 0 **(g)** 13 **(h)** -20 **(i)** 0 **(j)** 1 **(k)** 5 **(l)** -7 **(m)** -1 **(n)** -3

2. **(a)** $\log_3 120$ **(b)** $\ln 10$ **(c)** $\log_3 121$ **(d)** $\ln\left(\frac{1}{9}\right)$ **(e)** $\log_9 2$ **(f)** $\ln 10$ **(g)** $\log_5 4$ **(h)** $\ln 2$ **(i)** $\ln\left(\frac{1}{3}\right)$ **(j)** $\log_{14}\left(\frac{a^3}{bc}\right)$ **(k)** $\ln\left(\frac{s^3w^5}{rt^2}\right)$ **(l)** $\log_7\left(\frac{x^{2/3}}{y^{3/4}}\right)$ **3.** **(a)** $10\log_2 x$ **(b)** $-7\ln y$ **(c)** $\frac{1}{2}\log_3 x$ **(d)** $\frac{1}{5}\ln x$ **(e)** $-3\log_6 x$ **(f)** $\frac{4}{5}\ln x$ **(g)** $\log_5(x+2)-\log_5(x-2)$ **(h)** $\ln x-\ln(x+1)-\ln(x+2)$ **(i)** $3\log_8 x+\log_8(x+2)$ **(j)** $\frac{1}{2}\ln(x+1)+\ln(2x-1)$ **(k)** $\frac{1}{2}\log_3 x-\frac{1}{2}\log_3(x+4)$ **(l)** $\frac{2}{3}\ln x-\frac{1}{3}\ln(2x+1)$

4. **(a)** 8.63345 **(b)** 6.40192 **(c)** 5.82728 **(d)** 0.91024 **(e)** -11.73607 **(f)** -0.24153 **(g)** -2.99573 **(h)** 20.08554 **(i)** 3.46718 **(j)** 1.85527 **5.** **(a)** 125 **(b)** e **(c)** e^2+1 **(d)** $\frac{1}{2e}$ **6.** **(a)** 0.36067 **(b)** 1.24267 **(c)** 0.04343 **(d)** 0.05057 **(e)** 0.25 **(f)** 2 **(g)** 0.1 **(h)** 0.05556 **7.** **(a)** $\frac{5\log_4 e}{5x+6}$ **(b)** $\frac{8(2x-5)\log_6 e}{x^2-5x}$ **(c)** $\frac{2\log e}{(x-1)(x+1)}$ **(d)** $\frac{60x^2\log_{12} e}{2x^3+5}$ **8.** **(a)** $\frac{1}{x}$ **(b)** $\frac{1}{x}$ **(c)** $\frac{6}{x}$ **(d)** $-\frac{2}{x}$ **(e)** $\frac{3}{4x}$ **(f)** $\frac{8}{2x+7}$ **(g)** $\frac{10}{6-5x}$ **(h)** $\frac{8}{x}$ **(i)** $-\frac{1}{x}$ **(j)** $\frac{5(2x+5)}{x^2+5x+3}$ **(k)** $-\frac{1}{x+3}$ **(l)** $-\frac{3x^2}{x^3+1}$ **(m)** $\frac{4}{6x-1}$ **(n)** $-\frac{3x}{2(3x^2+4)}$ **(o)** $\frac{6x-5}{(x-2)(3x+1)}$ **(p)** $\frac{11x-10}{2x(x-1)}$ **(q)** $\frac{x^2+12}{x(x^2+4)}$ **(r)** $\frac{-13}{(x+6)(2x-1)}$ **9.** **(a)** $x^2(3\ln x+1)$ **(b)** $\frac{2x^2\ln x+x^2-4}{x}$ **(c)** $\frac{2(\ln x-1)}{(\ln x)^2}$ **(d)** $2x\ln(x+1)+x-1$ **(e)** $\frac{6x^2\left[(1-x^3)\ln(1-x^3)-x^3\right]}{1-x^3}$ **(f)** $4(x-1)^3\left[\ln(x-1)^4+1\right]$ **(g)** $\frac{72x\left[\ln(3x^2+8)\right]^5}{3x^2+8}$ **(h)** $\frac{72x}{3x^2+8}$ **(i)** 0 **(j)** 1 **(k)** $\frac{2}{x\ln x}$ **(l)** $\frac{15}{(3x+1)\ln(3x+1)}$ **12.** $y=3x-1$

13. $y=2x-e$ **14.** **(a)** increasing for $x\in(0,2)$; decreasing for $x\in(2,\infty)$; relative maximum at $(2,\ln 2-1)$ **(b)** decreasing for $x\in(0,2)$; increasing for $x\in(2,\infty)$; relative minimum at $(2,4-8\ln 2)$ **15.** concave down for $x\in(0,1/e)$; concave up for $x\in(1/e,\infty)$ **16.** maximum temperature of 40.17°C after 8.09 hours

SOLUTIONS TO: OUTCOME 7 DAY 3 ASSIGNMENT

1. **(a)** 54.59815 **(b)** 679.57046 **(c)** 12.69648 **(d)** 6.59489 **(e)** 0.50321 **(f)** 1.06473 **(g)** 201.17974 **(h)** 286.04879 **2.** **(a)** 23 **(b)** 4 **(c)** −7 **(d)** 1/4 **(e)** 1/9 **(f)** 81 **(g)** −12 **(h)** 2 **3.** **(a)** mirror about the y-axis **(b)** mirror about the x-axis **(c)** shift up 3 **(d)** shift down 2 **(e)** move 5 to the right **(f)** move 1 to the left **(g)** stretch vertically by a factor of 2—double every y value **(h)** compress vertically by a factor of 3—divide every y-value by 3 **(i)** stretch horizontally by a factor of 2 **(j)** compress horizontally by a factor of 2

4. **(a)** 5.54518 **(b)** −0.17329 **(c)** 0.03333 **(d)** −0.13534 **5.** **(a)** $7^x \ln 7$ **(b)** $2\left(3^{2x+5}\right)\ln 3$

(c) $\left(3x^2-4\right)\left(\frac{2}{3}\right)^{x^3-4x}\ln(2/3)$ **(d)** $12x^2\left(2^{x^3}\right)\ln 2$ **(e)** $-18\left(5^{-3x}\right)\ln 5$ **(f)** $2x^3\left(5^{3-x}\right)(4-x\ln 5)$

(g) $\frac{3^x(x\ln 3-2)}{x^3}$ **(h)** $2^x\left(3^{x^2}\right)(\ln 2+2x\ln 3)$ **6.** $8e^{8x}$ **7.** $-4e^{-4x}$ **8.** $15e^{5x}$ **9.** $8e^{-4x}$ **10.** $-12xe^{2-x^2}$

11. $(2x-5)e^{x^2-5x+6}$ **12.** $-6x^2e^{-2x^3}$ **13.** $-40(x-1)e^{4x-2x^2}$ **14.** $3(x-4)^2e^{(x-4)^3}$ **15.** $30(3x+1)e^{-(3x+1)^2}$

16. $\frac{-2e^{2/x}}{x^2}$ **17.** $\frac{88x^{-4/x^2}}{x^3}$ **18.** $-\frac{4e^{4/(x+3)}}{(x+3)^2}$ **19.** $\frac{54x^2e^{-2/(x^3+4)}}{\left(x^3+4\right)^2}$ **20.** 7 **21.** $2x(3x-1)$ **22.** $4x^3$

23. $\frac{-6}{(2x-1)^4}$ **24.** $(x+1)e^x$ **25.** $2x(x+2)e^x$ **26.** $(2x+5)e^{2x}$ **27.** $\left(2x^2+8x+9\right)e^{(x+2)^2}$

28. $12x^2\left(x^3+2\right)e^{2x^3+3}$ **29.** $\frac{1-x}{e^x}$ **30.** $\frac{(2x-3)e^{2x}}{2x^4}$ **31.** $\frac{8(2x+1)e^{4x+3}}{(4x+3)^2}$ **32.** $\frac{3e^{\sqrt{x}}}{\sqrt{x}}$ **33.** $\frac{-3e^{\sqrt[4]{x^3}}}{\sqrt[4]{x}}$

34. $\pi(\pi x+1)e^{\pi x}$ **35.** $8x^3$ **36.** 1 **37.** $\frac{(6x+1)e^{3x-1}}{(2x+1)^2}$ **38.** 0 **39.** $3e^3x^2$ **40.** $5e^{5x}$ **41.** $60e^{10(6x-5)}$

42. $\frac{3e^{3x}}{e^{3x}+2}$ **43.** $\frac{e^x(x\ln x+1)}{x}$ **44.** $\frac{-2e^x}{e^{2x}-1}$ **45.** $\ln x+2x+1$ **46.** $2^{50}e^{2x}$ **48.** $y=2ex-e$ **49.** $y=e^2$

50. **(a)** increasing for $x\in(-\infty,-2)\cup(0,\infty)$; decreasing for $x\in(-2,0)$ **(b)** relative maximum $\left(-2,\frac{4}{e^2}\right)$; relative minimum $(0,0)$ **51.** **(a)** concave down for $x\in(-\infty,-2)$; concave up for $x\in(-2,\infty)$ **(b)** inflection point at $\left(-2,-\frac{2}{e^2}\right)$ **52.** **(a)** $L(4)\approx 660$, $L(7)\approx 3312$, $L(9)\approx 2719$

SOLUTIONS TO REVIEW

1. (a) 6 **(b)** 0 **(c)** $\frac{9}{7}$ **(d)** 0 **(e)** $\frac{4}{3}$ **(f)** 0 **(g)** 2 **(h)** 3 **2.** 2 **3. (a)** $210x^9$ **(b)** $-18\sin 3x$ **(c)** $4\cos 20x$

(d) $6e^{3x}$ **(e)** $\frac{2x+5}{x(x+5)}$ **(f)** $\cot x \log_5 e$ **(g)** $10^x \ln 10$ **(h)** $4x^3$ **(i)** $-3x^2e^{-x^3}$ **(j)** $\frac{5}{x}$ **(k)** $\frac{-\sin(\ln 2x)}{x}$

(l) $e^{2x}(2x+1)$ **(m)** $2x(x\cos 2x+\sin 2x)$ **(n)** $20e^{20x}$ **(o)** $-3\tan 3x$ **(p)** $-\cos\left(\frac{x}{3}\right)$ **(q)** $-2x^{-3}$

(r) $-2\sin x\cos^{29} x$ **(s)** $(3\ln 5)(x^2)(5^{x^3})$ **(t)** 0 **(u)** $\frac{1}{x}\log e$ **(v)** $\frac{-1}{x(x-1)}$ **(w)** $12e^{6x}\cot(2e^{6x})$

(x) $24e^{6x+2}$ **4. (a)** $\frac{1}{2}(x-5)^{-1/2}(1)\ln\sqrt{x-5}+\sqrt{x-5}\frac{1}{\sqrt{x-5}}\frac{1}{2}(x-5)^{-1/2}(1)$ **(b)** $3\left[\ln(x^2+1)\right]^2\frac{1}{x^2+1}(2x)$

(c) $\dfrac{(\cos 3x)(3)e^{(x^2+1)^5}-(\sin 3x)e^{(x^2+1)^5}5(x^2+1)^4(2x)}{\left[e^{(x^2+1)^5}\right]^2}$ **(d)** $5\cos^3 2x+5x(3)(\cos 2x)^2(-\sin 2x)(2)$

(e) $2\sin x\cos x+(\cos x^2)(2x)$ **(f)** $\{-\sin[\sin(\cos x)]\}[\cos(\cos x)](-\sin x)$ **5.** $\frac{1}{3+\cos y}$ **6.** $2\pi/3$

7. $y=e^{-(x+2)}-3$ **8.** $-1/4$ **9.** $x^2(12\ln x+7)$ **10.** $(1,-2)$ is a relative minimum point. **11.** 1 **12.** 1

13. (a) $(x-3)e^x$; $(x-2)e^x$ **(b)** decreasing for $x\in(-\infty,3)$; increasing for $x\in(3,\infty)$ **(c)** $(3,-e^3)$ is a relative minimum **(d)** concave down for $x\in(-\infty,2)$; concave up for $x\in(2,\infty)$ **(e)** $(2,-2e^2)$

14. (a) 8.02118 **(b)** 4.82831 **(c)** 1.58496 **(d)** 0.75680 **(e)** 1.86037 **15. (a)** $s(0)=0.0$, $s(10)=55.1$,