OUTCOME 8A DAY 1 ASSIGNMENT (Section 9.1) (Solutions p 42)

For each of the following, find a function $f(x)$ that has the given derivative or differential.

1. $f'(x) = 6x^2 + 12x - 7$

2. $f'(x) = x + 1 + x^{-1} + x^{-2}$

3. $f'(x) = \cos x + \sin x + e^x$

4. $dy = (20x + 3)dx$

5. $dy = \cos 6x dx$

6. $dy = \left(e^{2x} + e^{-2x}\right)dx$

For each of the following, find the function $f(x)$ that passes through the given point and has the given derivative.

7. $(3,4)$; $f'(x) = 2x - 4$

8. $(-2,-3)$; $f'(x) = 4x^3 - 3x^2$

9. $\left(2, 4 + e^2\right)$; $f'(x) = x + e^x$

Determine each of the following integrals by sight. Some may require simplification before you can integrate.

10. $\int 14 dx$

11. $\int -\frac{3}{5} dx$

12. $\int 12x dx$

13. $\int 24x^5 dx$

14. $\int r^{3/5} dr$

15. $\int h^{1/2} dh$

16. $\int 14w^{4/3} dw$

17. $\int x^{-7/8} dx$

18. $\int g^{-1/4} dg$

19. $\int 2x^{-2/3} dx$

20. $\int \frac{1}{m} dm$

21. $\int \sqrt[6]{x^5} dx$

22. $\int x^4\left(x^2 - 1\right)dx$

23. $\int (x-3)(x+2)dx$

24. $\int (4-3t)(2t-1) dt$

25. $\int (3a+2)^2 da$

26. $\int \sqrt{b}(b+6)db$

27. $\int \frac{6}{x^3} dx$

28. $\int \frac{2}{\sqrt{x}} dx$

29. $\int \sqrt[3]{x}(x-1)^2 dx$

30. $\int \frac{10}{x} dx$

31. $\int \frac{2x^2 - 4}{x^3} dx$

32. $\int \sin 3x dx$

33. $\int \cos 8u du$

34. $\int -\sin \frac{1}{6} u du$

35. $\int 12 \cos \frac{1}{4} x dx$

36. $\int e^{6x} dx$

37. $\int 2e^{\frac{1}{6}x} dx$

38. $\int \frac{1 + x - x^2 + x^3}{x^2} dx$

39. $\int dx$

40. $\int \frac{\pi}{x} dx$

41. $\int \frac{x}{e} dx$

42. $\int 3^x dx$

43. $\int x^3 dx$

44. $\int \sqrt{3x} dx$

45. $\int \frac{3}{x} dx$

OUTCOME 8A DAY 2 ASSIGNMENT (Section 11.3) (Solutions p 43)

1. $\int e^{\sin x} \cos x dx$; let $u = \sin x$

2. $\int x\left(2x^2 + 5\right)^8 dx$; let $u = 2x^2 + 5$

3. $\int x^2 \cos 5x^3 dx$; let $u = 5x^3$

4. $\int \dfrac{1}{10x+7} dx$; let $u = 10x + 7$

5. $\int \sqrt{5x-9} dx$; let $u = 5x - 9$

6. $\int \dfrac{\sin(\ln x)}{x} dx$; Let $u = \ln x$.

7. $\int e^{6x} dx$

8. $\int \cos 4x dx$

9. $\int \dfrac{1}{3x+8} dx$

10. $\int (6x-11)^8 dx$

11. $\int x\left(x^2 - 6\right)^{11} dx$

12. $\int x^2 \sin x^3 dx$

13. $\int 3^{2x+1} dx$

14. $\int x\sqrt{2x^2 - 5} dx$

15. $\int \dfrac{\sin\sqrt{x}}{\sqrt{x}} dx$

16. $\int \sqrt{x+2} dx$

17. $\int \dfrac{5}{(x-2)^3} dx$

18. $\int (3-t)^4 dt$

19. $\int \dfrac{x}{x^2-4} dx$

20. $\int \dfrac{3x+1}{\sqrt{3x^2+2x+1}} dx$

21. $\int \sin\theta e^{\cos\theta} d\theta$

22. $\int \dfrac{e^{\sqrt{x-1}}}{\sqrt{x-1}} dx$

23. $\int (3x+7)^{4.2} dx$

24. $\int \sqrt[4]{5-2x} dx$

25. $\int \sin\dfrac{1}{2}x dx$

26. $\int (r+2)^{20} dr$

27. $\int \dfrac{x}{\left(x^2-1\right)^{11}} dx$

28. $\int \sin x e^{\cos x} dx$

29. $\int (\sin 2t)^3 \cos 2t dt$

30. $\int \sin x\sqrt{\cos x} dx$

31. $\int x^2 \sqrt[4]{x^3+4} dx$

32. $\int \dfrac{x+1}{x^2+2x-5} dx$

33. $\int e^x \left(e^x + 1\right)^4 dx$

34. $\int \dfrac{(\ln x)^4}{x} dx$

35. $\int \cos^6 x \sin x dx$

36. $\int \dfrac{x+5}{x^2+10x-23} dx$

37. $\int e^{4x} \cos\left(e^{4x}\right) dx$

38. $\int x^4 \cos x^5 dx$

39. $\int x^3 \sin x^4 \left(\cos^5 x^4\right) dx$

40. $\int x^2 e^{-x^3} dx$

41. $\int e^{-\sin x} \cos x dx$

42. $\int x\cos\left(x^2-1\right) dx$

43. $\int \dfrac{\sqrt{\ln x}}{x} dx$

44. $\int \sin x \cos x dx$

45. $\int \dfrac{\cos x}{\sin x} dx$

46. $\int \dfrac{e^{1/x}}{x^2} dx$

47. $\int \dfrac{x}{\left(x^2+1\right)^{5/2}} dx$

48. $\int 3x^2 \cos x^3 dx$

49. $\int \left(x^3-5\right) e^{x^4-20x} dx$

50. $\int (\cos 2t) e^{\sin 2t} dt$

51. $\int (1+\sin x)^4 \cos x dx$

52. $\int x^{1/3}\sqrt{x^{4/3}+1} dx$

53. $\int \dfrac{\cos x}{1+\sin x} dx$

54. $\int \dfrac{e^x+e^{-x}}{e^x-e^{-x}} dx$

CALCULUS 30: TOPIC 7 OUTCOME 8 (INTEGRATION)

OUTCOME 8A DAY 3 ASSIGNMENT (Section 11.2) (Solutions p 44)

Evaluate each of the following definite integrals. You should be able to evaluate each integral by sight.

1. $\int_2^5 10\,dx$

2. $\int_{-2}^1 (4-x)\,dx$

3. $\int_2^6 x^2\,dx$

4. $\int_{-3}^3 (x-1)^2\,dx$

5. $\int_{-5}^{-1} (t^2+4t-5)\,dt$

6. $\int_0^{13}\sqrt[3]{x^2}\,dx$

7. $\int_{-4}^{-2}\dfrac{1}{x^2}\,dx$

8. $\int_1^3 \dfrac{w^2+1}{w}\,dw$

9. $\int_1^4 \sqrt{b}\,(b-2)\,db$

10. $\int_0^{\pi/2}\cos x\,dx$

11. $\int_0^{3\pi/4}\sin x\,dx$

12. $\int_2^6 e^x\,dx$

13. $\int_{\ln 2}^{\ln 6} e^x\,dx$

14. $\int_0^{3\pi/2}\cos\dfrac{x}{3}\,dx$

15. $\int_{\pi/8}^{\pi/4}\sin 4x\,dx$

16. $\int_3^6 \dfrac{1}{x}\,dx$

17. $\int_e^{e^3}\dfrac{1}{x}\,dx$

18. $\int_1^4 \sqrt{t}\,dt$

19. $\int_4^9 \dfrac{x^2-x}{\sqrt{x}}\,dx$

20. $\int_{-3}^{-2} e^{3x}\,dx$

Evaluate each of the following definite integrals. Begin with a u substitution.

29. $\int_0^1 x\left(x^2+1\right)^5\,dx$

30. $\int_{-1}^1 (x+1)e^{x^2+2x}\,dx$

31. $\int_0^{\pi/2}\cos^3 x\sin x\,dx$

32. $\int_{-2}^{-1}\dfrac{1}{(2x+1)^4}\,dx$

33. $\int_0^5 \sqrt{1+3r}\,dr$

34. $\int_{-3}^{-1}\dfrac{2x}{x^2+5}\,dx$

35. $\int_0^{\pi/2} e^{\sin x}\cos x\,dx$

36. $\int_{-\pi/6}^{\pi/2}\cos x\cos(\sin x)\,dx$

OUTCOME 8A DAY 4 ASSIGNMENT (Section 11.2) (Solutions p 44)

Find the area of the region bounded by the x-axis below, $y=f(x)$ above, and the given pair of vertical lines. Calculate your areas in questions 9 to 12 both with and without a graphing calculator.

1. $f(x)=x^2$, $x=1$, $x=3$.

2. $f(x)=2x+4$, $x=-1$, $x=1$

3. $f(x)=\dfrac{1}{x}$, $x=2$, $x=6$

4. $f(x)=e^x$, $x=-2$, $x=2$

5. $f(x)=\sin x$, $x=0$, $x=\pi/2$

6. $f(x)=\sqrt{x}$, $x=1$, $x=4$

7. $f(x)=x^{-3}$, $x=1/2$, $x=1$

8. $f(x)=\cos 2x$, $x=0$, $x=\pi/4$

9. $f(x)=x\sqrt{25-x^2}$, $x=0$, $x=5$

10. $f(x)=xe^{x^2}$, $x=0$, $x=2$

11. $f(x)=\dfrac{20x}{x^2+1}$, $x=1$, $x=3$

12. $f(x)=\cos^2 x\sin x+1$, $x=0$, $x=2\pi$

OUTCOME 8A DAY 5 ASSIGNMENT (Section 11.2) (Solutions p 44)

Find the area of the region bounded by the x-axis above, $y = f(x)$ below, and the given pair of vertical lines.

1. $f(x) = -5$, $x = -2$, $x = 3$

2. $f(x) = -2x - 4$, $x = -1$, $x = 6$

3. $f(x) = x^2 - 9$, $x = 1$, $x = 3$

4. $f(x) = 2x - x^2$, $x = 2$, $x = 3$

5. $f(x) = \dfrac{1}{x}$, $x = -4$, $x = -2$

6. $f(x) = \cos x$, $x = \pi/2$, $x = 7\pi/6$

7. $f(x) = -e^{2x}$, $x = -1$, $x = 1$

8. $f(x) = \sqrt{x} - 3$, $x = 1$, $x = 4$

9. $f(x) = 3\sin\dfrac{1}{2}x$, $x = 2\pi$, $x = 3\pi$

10. $f(x) = \dfrac{4}{2x+1}$, $x = -4$, $x = -1$

11. $f(x) = x(x^2 + 1)^4$, $x = -2$, $x = 0$

12. $f(x) = e^{\cos x}\sin x$, $x = -\pi$, $x = 0$

Find the total area bounded by the function, the x-axis, and the given pair of vertical lines. A good sketch is essential. It will be important to find the x-intercept(s) of the function that lie between the vertical lines.

13. $f(x) = 2x$, $x = -2$, $x = 3$

14. $f(x) = 2 - x$, $x = -1$, $x = 6$

15. $f(x) = 4 - x^2$, $x = -3$, $x = 1$

16. $f(x) = \sin 2x$, $x = -\pi/4$, $x = \pi/3$

17. $f(x) = e^x - 1$, $x = -1$, $x = 3$

18. $f(x) = \sqrt{x} - 3$, $x = 1$, $x = 16$

Extra Question (You should REALLY do this one!).
Find the area trapped between the curve f(x) = x³ - 9x - 2x² + 18 and the x axis.

OUTCOME 8A DAY 6 ASSIGNMENT (Section 10.2) (Solutions p 45 & 46)

Find the area bounded by the two curves and the given pair of lines. Draw a sketch of the situation.

1. $y = 3$, $y = 1 - x$, $x = -1$, $x = 2$

2. $y = x - 4$, $y = 6 - 2x$, $x = 1$, $x = 3$

3. $y = x$, $y = x^2$, $x = 1$, $x = 2$

4. $y = \sqrt{x}$, $y = \sqrt[3]{x}$, $x = 0$, $x = 1$

5. $y = e^x$, $y = e^{x/2}$, $x = 0$, $x = 2$

6. $y = \sin x$, $y = \cos x$, $x = \pi/4$, $x = 5\pi/4$

7. $y = \dfrac{1}{x}$, $y = \dfrac{1}{x+4}$, $x = -3$, $x = -1$

8. $y = x^2 - 4x$, $y = x^2 - 2x$, $x = 1$, $x = 3$

9. $y = x^2 + 2x + 1$, $y = -x^2 + 2x - 2$, $x = -1$, $x = 1$

10. $y = \dfrac{4x}{\sqrt{x^2 + 1}}$, $y = x^2 + 3$, $x = -1$, $x = 1$

Find the area trapped by the two curves. Draw a sketch of the situation.

11. $y = 4x$, $y = x^2$

12. $y = x^2 - 2x$, $y = x + 4$

13. $y = \sqrt{x}$, $y = \dfrac{1}{2}x$

14. $y = x^3$, $y = 2x^2 - x$

15. $y - x^2 + 3x + 2$, $y = -x^2 + 5x + 6$

16. $y = x^3$, $y = 4x$

17. $y = x^3 + x^2$, $y = 4x + 4$

18. $y = x^3 - 9x$, $y = 9 - x^2$

OUTCOME 8A DAY REVIEW ASSIGNMENT   **(Solutions p 47)**

PART A:

4. Evaluate each of the following integrals by sight. You may have to simplify the integrand.

(a) $\int\left(x^2+4x-5\right)dx$ (b) $\int e^{9x}dx$

(c) $\int 3\sin 6x dx$

(d) $\int -\frac{2}{3}\cos 2x dx$

(e) $\int \frac{8}{x}dx$ (f) $\int x^5 dx$

(g) $\int \cos 3x dx$

(h) $\int\left[(x-5)(x+4)\right]dx$

(i) $\int \sin\frac{1}{2}x dx$ (j) $\int dx$

(k) $\int \frac{x^{10}-9x^7}{x^5}dx$

(l) $\int \frac{1}{20}dx$

(m) $\int \sin\pi x dx$ (n) $\int\left(1+\sqrt{x}\right)^2 dx$

(o) $\int 5^x dx$

(p) $\int -6\cos\frac{1}{2}x dx$

(q) $\int\left(x-\frac{1}{x}\right)dx$ (r) $\int \sin\frac{1}{4}x dx$

(s) $\int e^{x/2}dx$

(t) $\int 10^x \ln 10 dx$

(u) $\int \frac{x+2}{x}dx$ (v) $\int \frac{12}{x^2}dx$

(w) $\int \frac{x-10}{\sqrt[3]{x}}dx$

(x) $\int x^{-7/5}dx$

5. Evaluate each integral by using u substitution.

(a) $\int x^2\sqrt{x^3-1}dx$

(b) $\int(2x+3)\left(x^2+3x+1\right)^{11}dx$

(c) $\int e^{\cos x}\sin x dx$

(d) $\int \frac{x^{-1}}{1+\ln x}dx$

(e) $\int e^{2x}\cos\left(e^{2x}\right)dx$

(f) $\int \frac{x}{\sqrt{x^2+1}}dx$

(g) $\int \frac{\ln x}{x}dx$

(h) $\int \frac{4x+12}{x^2+6x+1}dx$

(i) $\int \sin^2 x\cos x\cos\left(\sin^3 x\right)dx$

(j) $\int \frac{7}{5-x}dx$

(k) $\int \sin^2 x\cos x dx$

(l) $\int \frac{\cos\sqrt{x}}{\sqrt{x}}dx$

(m) $\int(x+1)e^{3x^2+6x-4}dx$

(n) $\int \frac{\left(1+\frac{1}{x}\right)^5}{x^2}dx$

(o) $\int \cot 2x dx$

(p) $\int \frac{x}{\left(5x^2+2\right)^3}dx$

(q) $\int 12x\sqrt[5]{1-x^2}dx$

(r) $\int \frac{\sqrt{\ln x}}{x}dx$

CONTINUED ON NEXT PAGE.....

(s) $\int \dfrac{\cos x}{\sin^3 x} dx$

(t) $\int \dfrac{1+\cos x}{(x+\sin x)^2} dx$

(u) $\int \left(\dfrac{1}{x-2} + \dfrac{1}{x+2} \right) dx$

(v) $\int \dfrac{x}{x^4 + 2x^2 + 1} dx$

(w) $\int e^{(2x+1)^3} (2x+1)^2 dx$

(x) $\int \dfrac{3x + 2\cos x}{3x^2 + 4\sin x} dx$

6. Evaluate each of the following definite integrals.

(a) $\int_4^5 (4x - 1) dx$

(b) $\int_0^{\pi/2} \sin \dfrac{1}{2} x dx$

(c) $\int_{-4}^{-2} e^{-2x} dx$

(d) $\int_e^{e^4} \dfrac{1}{x} dx$

(e) $\int_1^9 \sqrt{x} dx$

(f) $\int_0^{\pi/3} \dfrac{\sin x}{\cos^3 x} dx$

(g) $\int_{-3}^{-2} \dfrac{dx}{(x+5)^2}$

(h) $\int_1^{2\sqrt{2}} x\sqrt{x^2 + 8} dx$

PART B:

Find the area of the region enclosed by the given lines and/or curves.

1. $y = \dfrac{12}{x^2}$, $x = 1$, $x = 3$, the x-axis.

2. $y = x^2 - x - 6$, the x-axis.

3. $y = 5$, $y = 4 - x^2$, $x = 0$, $x = 3$

4. $y = 2\sqrt[3]{x}$, the x-axis, $x = 1$, $x = 8$

5. $y = 3x^2 + 2$, $x = -1$, $x = 2$, the x-axis

6. $y = 11 - x^2$, $y = x^2 - 4x + 5$

7. $y = \sqrt{\sin x} \cos x$, $x = 0$, $x = \pi/2$, the x-axis

8. $y = \sqrt{x+1}$, $x = 0$, $x = 8$, the x-axis

9. $y = 2 - x^2$, $y = -x$

10. $y = x^4 - 1$, the x-axis

11. $y = e^{x/2}$, $x = 2$, $x = 6$, the x-axis

12. $y = e^{2x}$, $y = e^{3x}$, $x = 0$, $x = 1$

13. $y = x^3 + 4x^2$, $y = 4x + 16$

14. $y = x - 2$, $x = y^2$

15. Find the area of the region in the first quadrant below $y = x^2$, below $y = 12 - 4x$, and above the x-axis.

CALCULUS 30: **SOLUTIONS TO WORKBOOK ASSIGNMENTS**

SOLUTIONS TO: OUTCOME 8A DAY 1 ASSIGNMENT

1. $2x^3 + 6x^2 - 7x + C$ 2. $\frac{1}{2}x^2 + x + \ln|x| - x^{-1} + C$ 3. $\sin x - \cos x + e^x + C$ 4. $10x^2 + 3x + C$

5. $\frac{1}{6}\sin 6x + C$ 6. $\frac{1}{2}e^{2x} - \frac{1}{2}e^{-2x} + C$ 7. $f(x) = x^2 - 4x + 7$ 8. $f(x) = x^4 - x^3 - 27$

9. $f(x) = \frac{1}{2}x^2 + e^x + 2$ 10. $14x + C$ 11. $-\frac{3}{5}x + C$ 12. $6x^2 + C$ 13. $4x^6 + C$ 14. $\frac{5}{8}r^{8/5} + C$

15. $\frac{2}{3}h^{3/2} + C$ 16. $6w^{7/3} + C$ 17. $8x^{1/8} + C$ 18. $\frac{4}{3}g^{3/4} + C$ 19. $6x^{1/3} + C$ 20. $\ln|m| + C$

21. $\frac{6}{11}x^{11/6} + C$ 22. $\frac{1}{7}x^7 - \frac{1}{5}x^5 + C$ 23. $\frac{1}{3}x^3 - \frac{1}{2}x^2 - 6x + C$ 24. $-2t^3 + \frac{11}{2}t^2 - 4t + C$

25. $3a^3 + 6a^2 + 4a + C$ 26. $\frac{2}{5}b^{5/2} + 4b^{3/2} + C$ 27. $-3x^{-2} + C$ 28. $4x^{1/2} + C$

29. $\frac{3}{10}x^{10/3} - \frac{6}{7}x^{7/3} + \frac{3}{4}x^{4/3} + C$ 30. $10\ln|x| + C$ 31. $2\ln|x| + 2x^{-2} + C$ 32. $-\frac{1}{3}\cos 3x + C$

33. $\frac{1}{8}\sin 8u + C$ 34. $6\cos\frac{1}{6}u + C$ 35. $48\sin\frac{1}{4}x + C$ 36. $\frac{1}{6}e^{6x} + C$ 37. $12e^{\frac{1}{6}x} + C$

38. $-x^{-1} + \ln|x| - x + \frac{1}{2}x^2 + C$ 39. $x + C$ 40. $\pi\ln|x| + C$ 41. $\frac{1}{2e}x^2 + C$ 42. $\frac{1}{\ln 3}3^x + C$ 43. $\frac{1}{4}x^4 + C$

44. $\frac{2}{3}\sqrt{3}x^{3/2} + C$ 45. $3\ln|x| + C$ 46. $\frac{1}{2}\sec 2x + C$ 47. $3\sin^{-1}x + C$ 48. $6\tan\frac{1}{3}x + C$

SOLUTIONS TO: OUTCOME 8A DAY 2 ASSIGNMENT

1. $e^{\sin x}+C$ 2. $\frac{1}{36}\left(2x^2+5\right)^9+C$ 3. $\frac{1}{15}\sin 5x^3+C$ 4. $\frac{1}{10}\ln|10x+7|+C$ 5. $\frac{2}{15}(5x-9)^{3/2}+C$

6. $-\cos(\ln x)+C$ 7. $\frac{1}{6}e^{6x}+C$ 8. $\frac{1}{4}\sin 4x+C$ 9. $\frac{1}{3}\ln|3x+8|+C$ 10. $\frac{1}{54}(6x-11)^9+C$

11. $\frac{1}{24}\left(x^2-6\right)^{12}+C$ 12. $-\frac{1}{3}\cos x^3+C$ 13. $\frac{3^{2x+1}}{2\ln 3}+C$ 14. $\frac{1}{6}\left(2x^2-5\right)^{3/2}+C$ 15. $-2\cos\sqrt{x}+C$

16. $\frac{2}{3}(x+2)^{3/2}+C$ 17. $-\frac{5}{2}(x-2)^{-2}+C$ 18. $-\frac{1}{5}(3-t)^5+C$ 19. $\frac{1}{2}\ln|x^2-4|+C$

20. $\sqrt{3x^2+2x+1}+C$ 21. $-e^{\cos\theta}+C$ 22. $2e^{\sqrt{x-1}}+C$ 23. $\frac{5}{78}(3x+7)^{5.2}+C$ 24. $-\frac{2}{5}(5-2x)^{5/4}+C$

25. $-2\cos\frac{1}{2}x+C$ 26. $\frac{1}{21}(r+2)^{21}+C$ 27. $-\frac{1}{20}\left(x^2-1\right)^{-10}+C$ 28. $-e^{\cos x}+C$ 29. $\frac{1}{8}\sin^4 2t+C$

30. $-\frac{2}{3}(\cos x)^{3/2}+C$ 31. $\frac{4}{15}\left(x^3+4\right)^{5/4}+C$ 32. $\frac{1}{2}\ln|x^2+2x-5|+C$ 33. $\frac{1}{5}\left(e^x+1\right)^5+C$

34. $\frac{1}{5}(\ln x)^5+C$ 35. $-\frac{1}{7}\cos^7 x+C$ 36. $\frac{1}{2}\ln|x^2+10x-23|+C$ 37. $\frac{1}{4}\sin\left(e^{4x}\right)+C$ 38. $\frac{1}{5}\sin x^5+C$

39. $-\frac{1}{24}\cos^6 x^4+C$ 40. $-\frac{1}{3}e^{-x^3}+C$ 41. $-e^{-\sin x}+C$ 42. $\frac{1}{2}\sin\left(x^2-1\right)+C$ 43. $\frac{2}{3}(\ln x)^{3/2}+C$

44. $\frac{1}{2}\sin^2 x+C$, also $-\frac{1}{2}\cos^2 x+C$ 45. $\ln|\sin x|+C$ 46. $-e^{1/x}+C$ 47. $-\frac{1}{3}\left(x^2+1\right)^{-3/2}+C$

48. $\sin x^3+C$ 49. $\frac{1}{4}e^{x^4-20x}+C$ 50. $\frac{1}{2}e^{\sin 2t}+C$ 51. $\frac{1}{5}(1+\sin x)^5+C$ 52. $\frac{1}{2}\left(x^{4/3}+1\right)^{3/2}+C$

53. $\ln|1+\sin x|+C$ 54. $\ln\left(e^x-e^{-x}\right)+C$ 55. $\tan^{-1}\left(e^x\right)+C$ 56. $\frac{1}{5}\sin^{-1}(5x)+C$ 57. $\frac{1}{3}\tan x^3+C$

58. $-\frac{1}{4}\cot^4 x+C$ 59. $\frac{1}{6}\sec^3 2x+C$ 60. $\frac{2}{5}\tan^{-1}\left(\frac{1}{5}x\right)+C$ 61. $-\frac{1}{2}\cot^2 e^x+C$ 62. $\tan^{-1}(\sin x)+C$

SOLUTIONS TO: OUTCOME 8A DAY 3 ASSIGNMENT

1. 30   2. $\dfrac{27}{2}$ 3. $\dfrac{208}{3}$ 4. 24   5. $-\dfrac{80}{3}$ 6. $\dfrac{3}{5}$ 7. $\dfrac{1}{4}$ 8. $\ln 3 + 4$ 9. $\dfrac{46}{15}$ 10. 1   11. $\dfrac{\sqrt{2}}{2} + 1$ 12. $e^6 - e^2$ 13. 4

14. 3   15. $\dfrac{1}{4}$ 16. $\ln 6 - \ln 3 = \ln\left(\dfrac{6}{3}\right) = \ln 2$ 17. 2   18. $\dfrac{14}{3}$ 19. $\dfrac{1076}{15}$ 20. $\dfrac{e^{-6} - e^{-9}}{3}$ 21. $\dfrac{\pi}{4}$ 22. $\dfrac{\pi}{6}$ 23.

24. $\dfrac{2\sqrt{3}}{9}$ 25. $2 - \sqrt{2}$ 26. $\sqrt{3} - 1$ 27. $\dfrac{\pi}{2}$ 28. $4 - 2\sqrt{2}$ 29. $\dfrac{21}{4}$ 30. $\dfrac{1}{2}e^3 - \dfrac{1}{2}e^{-1}$ 31. $\dfrac{1}{4}$ 32. $\dfrac{13}{81}$ 33. 14

34. $\ln\left(\dfrac{3}{7}\right)$ 35. $e - 1$ 36. $\sin 1 + \sin\left(\dfrac{1}{2}\right)$; recall $\sin(-\theta) = -\sin\theta$ 37. The function is not continuous on

SOLUTIONS TO: OUTCOME 8A DAY 4 ASSIGNMENT

1. $26/3\ u^2$ 2. $8\ u^2$ 3. $\ln 3\ u^2$ 4. $e^2 - e^{-2}\ u^2$ 5. $1\ u^2$ 6. $14/3\ u^2$ 7. $\dfrac{3}{2}\ u^2$ 8. $1/2\ u^2$ 9. $125/3\ u^2$

10. $\dfrac{e^4 - 1}{2}\ u^2$ 11. $10\ln 5\ u^2$ 12. $2\pi\ u^2$ 13. 6   14. The parabola has equation $y = -\dfrac{4h}{b^2}x^2 + h$. The area

SOLUTIONS TO: OUTCOME 8A DAY 5 ASSIGNMENT

1. $25\ u^2$ 2. $63\ u^2$ 3. $28/3\ u^2$ 4. $4/3\ u^2$ 5. $\ln 2\ u^2$ 6. $3/2\ u^2$ 7. $\dfrac{e^2 - e^{-2}}{2}\ u^2$ 8. $13/3\ u^2$ 9. $6\ u^2$

10. $2\ln 7\ u^2$ 11. $1562/5\ u^2$ 12. $e - e^{-1}\ u^2$ 13. $13\ u^2$ 14. $25/2\ u^2$ 15. $34/3\ u^2$ 16. $5/4\ u^2$

17. $e^{-1} + e^3 - 4\ u^2$ 18. $31/3\ u^2$ 19. $1/6\ u^2$ 20. $131/4\ u^2$ 21. $8\ u^2$

SOLUTIONS TO: OUTCOME 8A DAY 6 ASSIGNMENT

1. $15/2 \ u^2$
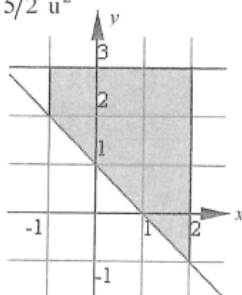
2. $8 \ u^2$
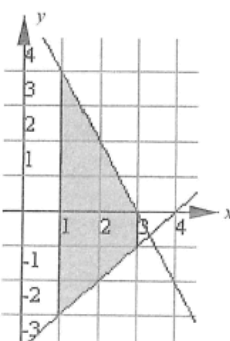
3. $5/6 \ u^2$
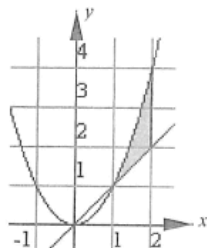
4. $1/12 \ u^2$
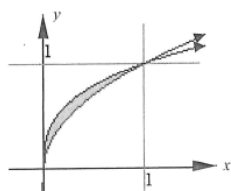
5. $e^2 - 2e + 1 \ u^2$
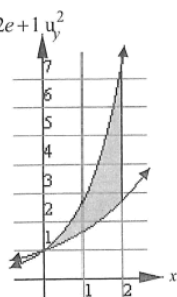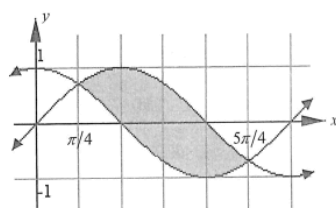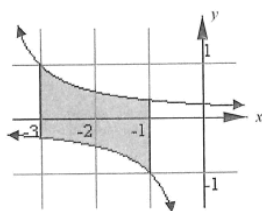
6. $2\sqrt{2} \ u^2$

7. $2\ln 3 \ u^2$

8. $8 \ u^2$

9. $22/3 \ u^2$

4. $1/12 \ u^2$

5. $e^2 - 2e + 1 \ u^2$

6. $2\sqrt{2} \ u^2$

7. $2\ln 3 \ u^2$

8. $8 \ u^2$

9. $22/3 \ u^2$

CALCULUS 30: TOPIC 7 OUTCOME 8 (INTEGRATION)
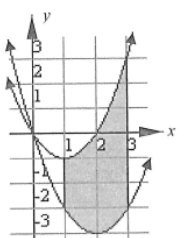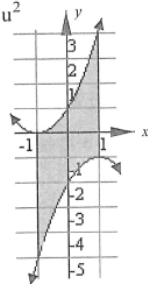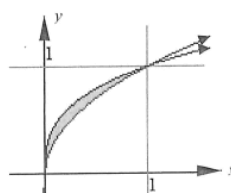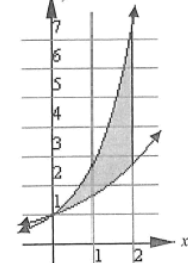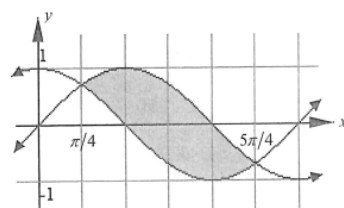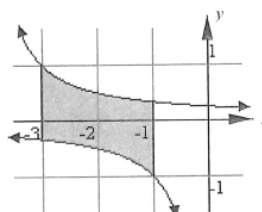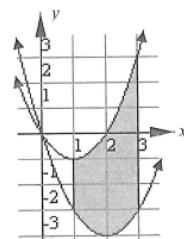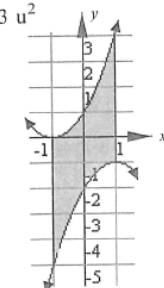
10. $20/3$ u^2
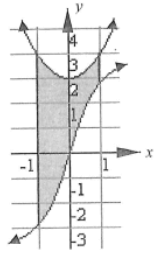
11. $32/3$ u^2
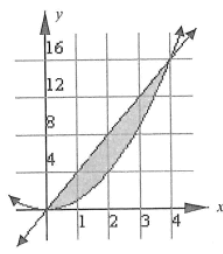
12. $125/6$ u^2
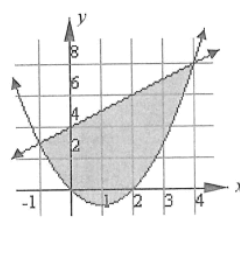
13. $4/3$ u^2
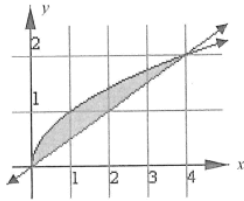
14. $1/12$ u^2
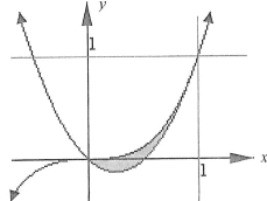
15. 9 u^2
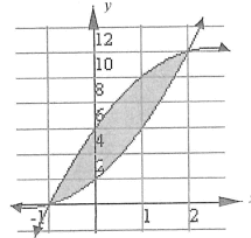
16. 8 u^2
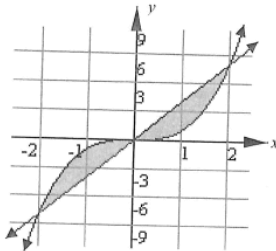
17. $71/6$ u^2
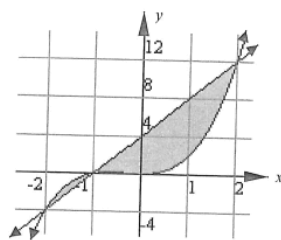
18. $148/3$ u^2
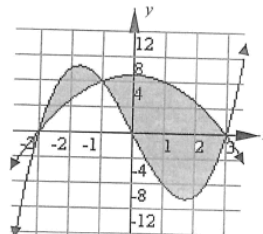
19. $\int_0^1 x^2\,dx + \int_1^2 \left[x^2 - (4x-4) \right] dx$
$= 2/3$ u^2
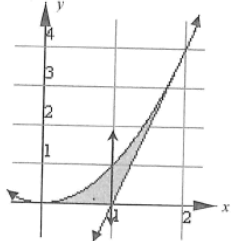
20. **(a)** 25 s **(b)** The car is $625/6$ metres ahead of the truck.
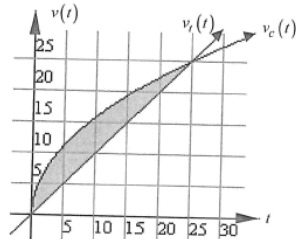
SOLUTIONS TO: OUTCOME REVIEW ASSIGNMENT

PART A: 1. (a) 0.1 (b) 50 (c) 51.5201 (d) dy is the change in y as you move from $x = 5$ to $x = 5.1$ along the tangent line drawn at $x = 5$. Δy is the change in y as you move from $x = 5$ to $x = 5.1$ along the function $y = x^4$. Since the tangent line will not coincide with the function, dy is just an approximation to Δy.

2. (a) 1030 (b) $3 - \dfrac{1}{108}$ or $2\dfrac{107}{108}$ (c) $100\dfrac{1}{15}$ 3. (a) $-24(2x+1)^3\, dx$ (b) $-4e^{4x}\sin\left(e^{4x}\right) dx$

(c) $\dfrac{2x}{x^2+16}\, dx$ 4. (a) $\dfrac{1}{3}x^3 + 2x^2 - 5x + C$ (b) $\dfrac{1}{9}e^{9x} + C$ (c) $-\dfrac{1}{2}\cos 6x + C$ (d) $-\dfrac{1}{3}\sin 2x + C$

(e) $8\ln|x| + C$ (f) $\dfrac{1}{6}x^6 + C$ (g) $\dfrac{1}{3}\sin 3x + C$ (h) $\dfrac{1}{3}x^3 - \dfrac{1}{2}x^2 - 20x + C$ (i) $-2\cos\dfrac{1}{2}x + C$ (j) $x + C$

(k) $\dfrac{1}{6}x^6 - 3x^3 + C$ (l) $\dfrac{1}{20}x + C$ (m) $-\dfrac{1}{\pi}\cos \pi x + C$ (n) $x + \dfrac{4}{3}x^{3/2} + \dfrac{1}{2}x^2 + C$ (o) $\dfrac{5^x}{\ln 5} + C$

(p) $-12\sin\dfrac{1}{2}x + C$ (q) $\dfrac{1}{2}x^2 - \ln|x| + C$ (r) $-4\cos\dfrac{1}{4}x + C$ (s) $2e^{x/2} + C$ (t) $10^x + C$ (u) $x + 2\ln|x| + C$

(v) $-12x^{-1} + C$ (w) $\dfrac{3}{5}x^{5/3} - 15x^{2/3} + C$ (x) $-\dfrac{5}{2}x^{-2/5} + C$ 5. (a) $\dfrac{2}{9}\left(x^3 - 1\right)^{3/2} + C$

5. (b) $\dfrac{1}{12}\left(x^2 + 3x + 1\right)^{12} + C$ (c) $-e^{\cos x} + C$ (d) $\ln(1 + \ln x) + C$ (e) $\dfrac{1}{2}\sin\left(e^{2x}\right) + C$ (f) $\sqrt{x^2+1} + C$

(g) $\dfrac{1}{2}(\ln x)^2 + C$ (h) $2\ln|x^2 + 6x + 1| + C$ (i) $\dfrac{1}{3}\sin\left(\sin^3 x\right) + C$ (j) $-7\ln|5 - x| + C$ (k) $\dfrac{1}{3}\sin^3 x + C$

(l) $2\sin\sqrt{x} + C$ (m) $\dfrac{1}{6}e^{3x^2 + 6x - 4} + C$ (n) $-\dfrac{1}{6}\left(1 + \dfrac{1}{x}\right)^6 + C$ (o) $\dfrac{1}{2}\ln|\sin 2x| + C$ (p) $-\dfrac{1}{20}\left(5x^2 + 2\right)^{-2} + C$

(q) $-5\left(1 - x^2\right)^{6/5} + C$ (r) $\dfrac{2}{3}(\ln x)^{3/2} + C$ (s) $-\dfrac{1}{2}(\sin x)^{-2} + C$ (t) $-(x + \sin x)^{-1} + C$

(u) $\ln|x - 2| + \ln|x + 2| + C$ or $\ln|x^2 - 4| + C$ (v) $-\dfrac{1}{2}\left(x^2 + 1\right)^{-1} + C$ (w) $\dfrac{1}{6}e^{(2x+1)^3} + C$

(x) $\dfrac{1}{2}\ln|3x^2 + 4\sin x| + C$ 6. (a) 17 (b) $2 - \sqrt{2}$ (c) $\dfrac{e^8 - e^4}{2}$ (d) 3 (e) $\dfrac{52}{3}$ (f) $\dfrac{3}{2}$ (g) $\dfrac{1}{6}$ (h) $\dfrac{37}{3}$ 7. 544

8. (a) $2\ln|\sqrt{x} + 1| + C$ (b) $\dfrac{1}{6}(2x - 1)^{3/2} + \dfrac{1}{2}(2x - 1)^{1/2} + C$ or $\dfrac{1}{3}\sqrt{2x-1}(x+1) + C$ 9. (a) $4\tan^{-1}(x) + C$

(b) $2\sin^{-1} x + C$ (c) $2\tan\dfrac{1}{2}x + C$ (d) $-2\csc 30x + C$ (e) $-\dfrac{1}{5}\cot 5x + C$ (f) $\dfrac{1}{2}\tan^{-1} 2x + C$

(g) $-12\cot\dfrac{1}{3}x + C$ (h) $\dfrac{2}{3}\sec 3x + C$ 10. (a) $\dfrac{1}{6}\tan^{-1}\left(\dfrac{2}{3}x\right) + C$ (b) $\dfrac{1}{10}\sin^{-1} 10x + C$ (c) $-\dfrac{1}{3}\cot\left(x^3\right) + C$

(d) $\dfrac{1}{2}e^{\tan 2x} + C$ (e) $-\dfrac{1}{4}\cot^4 x + C$ (f) $\dfrac{3}{4}(\tan x)^{4/3} + C$ 11. (a) $\dfrac{\pi}{2}$ (b) $\dfrac{\pi}{6}$ (c) $\dfrac{1}{2}$ (d) $2 - \dfrac{2\sqrt{3}}{3}$

PART B: 1. $8\,u^2$ 2. $125/6\,u^2$ 3. $12\,u^2$ 4. $45/2\,u^2$ 5. $15\,u^2$ 6. $64/3\,u^2$ 7. $2/3\,u^2$ 8. $52/3\,u^2$ 9. $9/2\,u^2$

10. $8/5\,u^2$ 11. $2e^3 - 2e\,u^2$ 12. $\dfrac{e^3}{3} - \dfrac{e^2}{2} + \dfrac{1}{6}\,u^2$ 13. $148/3\,u^2$ 14. $9/2\,u^2$ 15. $14/3\,u^2$

16. (a) $\dfrac{1}{e} - \dfrac{1}{e^b}\,u^2$ (b) $\dfrac{1}{e}\,u^2$ 17. (a) \$24/h (b) \$252 (c) 9.27 hours

CALCULUS 30: TOPIC 7 OUTCOME 8 (INTEGRATION)