Additional Mathematics Exercise 13 Answers

(*Techniques of Differentiation*)

1. (a) $20x^3$ (b) $12x^{-4}$ (c) $1.2x^{0.2}$

   (d) $-\frac{28}{3}x^{-\frac{7}{3}}$ (e) $-\frac{\pi}{2\sqrt{x^3}}$

2. (a) $6x-5$ (b) $18x^2-4x+1$ (c) $-\frac{5}{6}x^{-\frac{7}{2}}$

   (d) $-4x^{-5}-8x^{-3}+3x^{-2}$ (e) $-\frac{2}{5}x^{-\frac{6}{5}}+\frac{1}{4}x^{-\frac{5}{4}}-\frac{1}{3}x^{-\frac{4}{3}}$

   (f) $14x+22$ (g) $5x^4+24x^3+18x^{-2}-8x^{-3}$

3. $18\frac{1}{9}$

4. $a = 27$, $b = -44$

5. (a) $-9x^2+12x-1$ (b) $6x^2-18x+9$ (c) $12x-\frac{15}{2}x^{\frac{3}{2}}-x^{-\frac{1}{2}}$

   (d) $6x^5-4x^{-5}-2$ (e) $8x^3-3x^2-2x-1$

6. (a) $-\frac{2}{(x+4)^2}$ (b) $\frac{-3x^2+10x+12}{(x^2+4x)^2}$ (c) $\frac{-2x^2+6x+23}{(x^2+3x+7)^2}$

   (d) $-\frac{1}{(x+5)^2}-\frac{1}{(x-5)^2}$ (e) $-\frac{3x^{\frac{3}{2}}}{(x^2-\sqrt{x})^2}$ (f) $\frac{3x^4-7x^2-6x+2}{(x^2-1)^2}$

7. $-\frac{5}{4}$

8. $-\frac{5}{8}$

9. (a) $6x(x+1)(12x^6+36x^5+27x^4-1)$ (b) $-\frac{1}{3x^{\frac{4}{3}}(1+x)^{\frac{2}{3}}}$

10. (a) $6(x+1)(x^2+2x-4)^2$ (b) $-\frac{4x}{(x^2-4)^3}$

    (c) $-\frac{3(2x+3)}{(x^2+3x+5)^4}$ (d) $\frac{16x}{3\sqrt[3]{4x^2-1}}$

11. (a) $\frac{25}{2}(5x+2)^{\frac{3}{2}}$ (b) $\frac{(x-2)^2(11x-1)}{(3x+1)^{\frac{1}{3}}}$ (c) $\frac{3x+8}{(2x+3)^{\frac{3}{2}}}$

    (d) $\frac{3(x^2-2)^2(3x^2+2x+6)}{(3x+1)^4}$ (e) $\frac{3(2x-3)^{\frac{1}{2}}(-x^2+3x+4)}{(x^2+4)^{\frac{5}{2}}}$

(f) $\dfrac{2(x^3+5x-6)}{3(x+1)^2(x^2+1)^{\frac{2}{3}}}$

12. –120

13. $24x(x^2+3)^2[(x^2+3)^3-5]^3$

14. $\dfrac{1}{2}\left[1+\dfrac{3}{2}(x+1)^{-\frac{1}{2}}\right]\left[x+3(x+1)^{\frac{1}{2}}\right]^{-\frac{1}{2}}$

15. (a) $-\dfrac{9}{x^2}$ (b) $\dfrac{1}{\sqrt{2x}}$

16. (a) $\dfrac{3(t-2)}{t^2}$ (b) $4(t^2+1)\sqrt{t^2-1}$ (c) $\dfrac{t^2-1}{2t}$

17. $\dfrac{1}{5}$

18. $\dfrac{y^2}{y^2-1}$ (b) $\dfrac{\sqrt{y^2+2y}}{y+1}$ (c) $\dfrac{(y^2+1)^2}{4y}$

19. (a) $\dfrac{1}{5(2y+1)(2y+3)(y-1)^2}$ (b) $-\dfrac{2}{3}\sqrt{(2-y)(y+1)^3}$

20. $\dfrac{(3-2y^2)^2}{2(y+2)(4y+3)}$

21. (a) $-\dfrac{4x}{y}$ (b) $-\dfrac{3y}{3x+2y}$ (c) $\dfrac{y-x}{3y-x}$

(d) $\dfrac{1-y}{x+2y}$ (e) $\dfrac{3x-2y}{4x}$ (f) $-\dfrac{\sqrt{xy}+y\sqrt{x+y}}{\sqrt{xy}+x\sqrt{x+y}}$

22. $\dfrac{2}{5}$

23. (a) – (b) $a = 4$, $b = 3$; or $a = -4$, $b = -3$

24. (a) $24x^2-6x$ (b) $-6x^{-3}+12x^{-4}$ (c) $270(3x-4)^{-7}$

(d) $\dfrac{4}{(x+1)^3}$ (e) $4(x+1)(5x^2-14x+5)$ (f) $\dfrac{2y^2-\sqrt{x}}{16x^{\frac{3}{2}}y^3}$

25. $\left.\dfrac{d}{dx}[f(x)]\right|_{x=0}=\dfrac{3}{4\sqrt{2}}$, $\left.\dfrac{d^2}{dx^2}[f(x)]\right|_{x=0}=\dfrac{27}{16\sqrt{2}}$

26. –

27. $\dfrac{1}{2}$