

MATH 112 SOLUTIONS FOR 2.7, P. 179

1. (a)  $5x^4$ . (c)  $-7x^{-8}$ . (f) 0. (h)  $15x^4 - 5$ . (i)  $2x - 2x^{-3}$ . (j)  $3x^2 + 3x^{-4}$ . (l)  $16x^3 + 9x^2$ .
2. (b)  $(10x^4 - 8x)(3x^{10} + x^2) + (2x^5 - 4x^2)(30x^9 + 2x)$ .  
(c)  $4(2x + 1)$ . (g)  $1/(x + 1)^2$ . (h)  $\frac{2x^2 - 6x + 2}{(2x - 3)^2}$ .
3. (b)  $v = -32t$ ,  $a = -32$ ,  $s(4) = 144$ ,  $v(4) = -128$ ,  $a(4) = -32$ .
4. (b)  $60x^3$ . (f)  $-\frac{2abc}{(bx + c)^3}$
5. (a)  $\frac{(-1)^n n!}{(x + a)^{n+1}}$ . (c)  $100 \cdot 99 \cdots (101 - n)x^{100-n}$  if  $n \leq 100$ ; 0 if  $n > 100$ .
6. (a)  $y = 2x - 2$ . (b)  $y = 2x + 3$  (c)  $y = 13x - 11$ . (d)  $y = 4$ .
7. (a)  $y = -\frac{1}{2}x + \frac{1}{2}$ . (c)  $y = -\frac{1}{13}x + \frac{27}{13}$ .
8. (a)  $\frac{d}{dr}(\pi r^2) = 2\pi r$ .
9.  $\left(\frac{1}{\sqrt{3}}, \frac{1}{3\sqrt{3}}\right)$  and  $\left(\frac{-1}{\sqrt{3}}, \frac{-1}{3\sqrt{3}}\right)$
16.  $(fgh)' = [(fg)h]' = (fg)'h + (fg)h' = (f'g + fg')h + (fg)h' = f'gh + fg'h + fgh'$ .
19.  $\left(\frac{f}{g}\right)' = \left(f \cdot \frac{1}{g}\right)' = f' \cdot \left(\frac{1}{g}\right) + f \cdot \left(\frac{1}{g}\right)' = \frac{f'}{g} + f \cdot \left(\frac{-g'}{g^2}\right) = \frac{f'}{g} - \frac{fg'}{g^2} = \frac{f'g - fg'}{g^2}$ .
20.  $(fg)''' = f'''g + 3f''g' + 3f'g'' + fg'''$ ,  $(fg)^{(4)} = f^{(4)}g + 4f'''g' + 6f''g'' + 4f'g''' + fg^{(4)}$
24. Differentiation lowers the degree of a polynomial by 1. If  $p(x)$  is a polynomial of degree  $n$ , then  $p^{(n)}(x)$  has degree 0, so is a constant.  $p^{(n+1)}(x) = 0$ .