Answers:

1.

a) $20x^3 + 15x^2 + 1$

b) $10(x^2 + 3x + 2)^9(2x + 3)$

c) $10[(x^3 + 2x + 1)^6 + (x^5 + x^3 + 2)^5]^9[6(x^3 + 2x + 1)^5(3x^2 + 2) + 5(x^5 + x^3 + 2)^4(5x^4 + 3x^2)]$

d) $(9x^2 + 5)(7x^8 + 5x + 5) + (3x^3 + 5x + 2)(56x^7 + 5)$

e) $(35x^6(8x^9 + 5x + 5) - (5x^7 + 3)(72x^9 + 5))/(8x^9 + 5x + 1)^2$

f) $3x^2\sqrt{x} + (x^3 + 1)/(2\sqrt{x})$

2. $(f(x)/g(x) - f(a)/g(a))/(x - a)|_{x=a} = [(f(x)/g(x) - f(x)/g(a)) + (f(x) - f(a))/g(a)]/(x - a)|_{x=a} =$

$= (f(x)/(g(x)g(a)))(g(a)-g(x))/(x-a)|_{x=a}+(f(x)-f(a))/(x-a)/g(a)|_{x=a} =$

$= -f(x)g'(x)/(g(x))^2 + f''(x)/g(x) = (f''(x)g(x) - f(x)g'(x))/(g(x)^2)$

3. Differentiation yeilds $(7x^6 + 3x^2)(dx/dt) + 12t^3 + 2 = 0,$

so $dx/dt = -(12t^2 + 2)/(7x^6 + 3x^3)$

4. By differentiating the equation $(x^{p/q})^q = x^p$ we get $q(x^{p/q})^{q-1}(x^{p/q})' = px^{p-1}$

which gives us $(x^{p/q})' = (p/q)x^{p-1-(q-1)p/q} = (p/q)x^{(p/q)-1}$

7. $f(x)g(x)h(x) = f(x)(g(x)h(x))$, so $(f(x)(g(x)h(x))' = f'(x)(g(x)h(x))+ f(x)(g(x)h(x))' =$

$= f'(x)g(x)h(x) + f(x)g'(x)h(x) + f(x)g(x)h'(x)$