RECO 250 KEY Homework #4 Fa2009 Prof Kilkenny

Find the derivative and box your answers:

1. $f(x) = 8x^5$ $\boxed{f' = 40x^4}$

2. $y = 0.3x$ $\boxed{y' = 0.3}$

3. $y = 3t^{-2}$ $\boxed{y' = -6t^{-3}}$

4. $f(x) = 3x - 2$ $\boxed{df/dx = 3}$

5. $f(w) = w^{-7}$ $\boxed{f' = -7w^{-8}}$

6. $y = g(x) = 3x^2 - 5x - 2$ $\boxed{dy/dx = 6x-5}$

7. $z = f(Q) = 7Q^2 - 5Q + 3$ $\boxed{dz/dQ = 14Q-5}$

8. $R = bQ - aQ^2$ $\boxed{dR/dQ = b-2aQ}$

Evaluate the derivatives:

9. $y = -3p^3 + \frac{9}{2}p^2 + 9p - 9$ at $p=10$

$y' = -9p^2 + 9p+9$

$\boxed{y' = -801}$

10. $C = 0.1q^2 + 3$

at $q = 1000$ and $q=5000$

$C' = 0.2q$

$\boxed{C'(1,000) = 200}$
$\boxed{C'(5,000) = 1,000}$

11. $C = 0.001Q^3 - 0.02Q^2 + 5Q + 5,000$

$C' = 0.003Q^2 - 0.04Q + 5$

$\boxed{C'(10) = 4.9}$
$\boxed{C'(100) = 31}$

12. $R = 250Q + 45Q^2 - Q^3$

$R' = 250 + 90Q - 3Q^2$

$\boxed{R'(5) = 625}$
$\boxed{R'(10) = 850}$
$\boxed{R'(25) = 625}$

Using the *product , quotient,* or *chain rules* as needed; differentiate:

13. $y = (4x+1)(6x+3)$ $y' = 48x+18$

14. $s(t) = (8-7t)(t^2 - 2)$
$s' = 14+16t - 21t^2$

16. $y = \frac{1}{x^2} = x^{-2}$ $y' = -2x^{-3}$

17. $y = \frac{2x-3}{4x+1}$ $y' = \frac{14}{(4x+1)^2}$

18. $f(x) = (2x+1)^2$
$f' = 8x + 4$

19. $R = P(Q)\cdot Q$ *where* $P(Q) = a - bQ$
$dR/dQ = a-2bQ$

20. $f(q) = [\delta q^{\rho}]^{1/\rho}$
If we simplify first: $f(q) = \delta^{1/\rho} q$ *so* $f' = \delta^{1/\rho}$
Or, if we use the CHAIN RULE:

$f' = \rho \frac{1}{\rho} [\delta q^{\rho}]^{\frac{1}{\rho}-1} \delta q^{\rho-1}$

$= \delta^{\frac{1-\rho}{\rho}} \delta^{\frac{\rho}{\rho}} q^{\rho \cdot \frac{1-\rho}{\rho}} q^{\rho-1}$

$= \delta^{\frac{1-\rho+\rho}{\rho}} q^{1-\rho} q^{\rho-1}$

$= \delta^{\frac{1}{\rho}} q^{1-\rho+\rho-1} = \delta^{\frac{1}{\rho}} q^0$

$= \delta^{1/\rho}$ *(verified)*