GAMES Practice Problem Solutions – Derivative Computations

1. (a) $-\dfrac{4x+5}{x^6}$

   (b) $\dfrac{-3x^2+2x+4}{(x^2+x+1)^2}$

2. (a) $R(t) = q(t)p(t), R'(t) = q'(t)p(t) + q(t)p'(t)$

   (b) Revenue is increasing for two reasons. The first reason is the price is increasing with time. The second reason is the amount of oil extracted is increasing. Also note that the increase in price is proportional to how much is extracted and the increase in extractions proportional to price.

3. (a) $y' = 50\left(x^3+x^2\right)^{49}\left(3x^2+2x\right)$

   (b) $\frac{4}{3}(x+1)^{-2/3}(x+3)^{-4/3}$

   (c) $\dfrac{x}{\sqrt{x^2+1}}$

4. $y' = 125(1+\sqrt{x^3}+1)^{24}(\frac{3}{2})(t^3+1)^{-1/2}x^2$

5. (a) $y'40x(1+x^2)^3$

   (b) $y' = (\frac{-1}{x^2})(1-6(1+1/x)^5)$

6. $\dfrac{\mathrm{d}q}{\mathrm{d}p} = -\dfrac{a}{2\sqrt{ap-c}}$

7. (a) $v'(x) = z'(x^2)2x$

   (b) $v'(x) = k'(x^n w(x))(nx^{n-1}w(x) + w'(x)x^n)$

8. The total gas consumed is $b(t)$ in t hours. $b'(t) = B'(s(t))s'(t)$ is the rate per hour of gas used and is equal to the rate of fuel consumption multiplied by the speed of the truck.

9. (a) $y'' = 20x^3 - 36x^2$

   (b) $y'' = -\dfrac{1}{4x^{3/2}}$

   (c) $y'' = 20(1+x^2)^8(1+19x^2)$