2.2 Derivative of Polynomial Functions (Both sides of this page)

1. Using the Power Rule, and the Sums and Differences Rule, differentiate each of the following:
   a. $f(x)=3x^3-4x^2+3x-5$ b. $g(x)=2x^{-4}$ c. $h(x)=\frac{2}{3}x^3-\frac{3}{5}x^5+\frac{1}{2}x^4$

2. Differentiate each of the following:
   a. $f(x)=x^3(2x-5)$ b. $p(t)=\frac{t^4+4t^3-3t}{2t},\ t>0$ c. $y=-4x^{\frac{3}{2}}$
   d. $g(x)=\sqrt{x^3}+5\sqrt{x}$ e. $h(x)=\frac{2}{x^3}$

3. Determine the slope of the tangent to the given curve, at the given domain value:
   a. $f(x)=2x^3-5x+\sqrt{x},\ a=4$ b. $g(x)=3x^{\frac{2}{3}}-5x+1,\ a=8$
   c. $p(t)=\frac{5}{t^2},\ a=2$

4. Determine the equation of the tangent to the curve $f(x)=2x^3-5x^2+3$ at the point $P(2,-1)$.

5. Determine the value(s) of x so that the tangent to the function $f(x)=\frac{3}{\sqrt[3]{x}}$ is parallel to the line $x-8y+1=0$.

6. Tangents are drawn to the parabola $y=x^2$ at $(2,4)$ and $\left(-\frac{1}{8},\frac{1}{64}\right)$. Show that the tangents are perpendicular to each other. (From the Nelson Text: Pg. 83 #13)

7. Show that there are two tangents to the curve $g(x)=\frac{1}{5}x^5-10x$ that have a slope of 6. (From the Nelson Text: Pg. 83#16)

8. A subway train travels from one station to the next in 2 minutes. Its distance (in *km*) from the first station after *t* minutes is given by $s(t)=t^2-\frac{1}{3}t^3$. At what time with the train have a velocity of $0.5km/\min$. (From the Nelson Text: Pg. 84 #21)

9. Tangents are drawn from the point $(0,3)$ to the parabola $f(x) = -3x^2$. Find the coordinates of the points where the tangents touch the curve. (Draw a sketch)
(From the Nelson Text: Pg. 84 #23)

Answers to Selected Problems

1b) $g'(x) = -8x^{-5}$ 2a) $f'(x) = 8x^3 - 15x^2$ c) $y' = -6\sqrt{x}$ 3c) $m_{\tan} = -\frac{5}{4}$

4) $y = 4x - 7$ 8) $t = \frac{2 \pm \sqrt{2}}{2}$ sec $(0.29 \text{ and } 1.71 \text{ seconds})$