

# Differentiation Techniques

Math 2413  
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7 Feb 2019  
Pg 21

Practice - Find  $y'$ :

$$1) y = \frac{t-2}{2t+1} \quad y' = \frac{(t-2)'(2t+1) - (t-2)(2t+1)'}{(2t+1)^2} = \frac{(1)(2t+1) - (t-2)(2)}{(2t+1)^2} = \frac{2t+1-2t+4}{(2t+1)^2} = \frac{5}{(2t+1)^2}$$

$$2) y = \left(\frac{t-2}{2t+1}\right)^9 \quad y' = 9\left(\frac{t-2}{2t+1}\right)^8 \left(\frac{t-2}{2t+1}\right)' = 9\left(\frac{t-2}{2t+1}\right)^8 \left(\frac{5}{(2t+1)^2}\right) = \frac{45(t-2)^8}{(2t+1)^{10}}$$

$$3) y = (2x+1)^5 (x^3 - x + 1)$$

$$\begin{aligned} y' &= [(2x+1)^5]'(x^3 - x + 1) + (2x+1)^5 [(x^3 - x + 1)]' \\ &= 5(2x+1)^4 (2x+1)'(x^3 - x + 1) + (2x+1)^5 (3x^2 - 1) \\ &= 10(2x+1)^4 (x^3 - x + 1) + (2x+1)^5 (3x^2 - 1) \end{aligned}$$

$$4) y = \sin(x)\cos(x)$$

$$\begin{aligned} y' &= (\sin(x))' \cos(x) + \sin(x) (\cos(x))' \\ &= \cos(x)\cos(x) + \sin(x)(-\sin(x)) = \cos^2(x) - \sin^2(x) \end{aligned}$$

$$5) y = \sin(\cos(x))$$

$$y' = \cos(\cos(x))(-\sin(x)) = -\cos(\cos(x))\sin(x)$$

$$6) y = \sqrt{x + \sqrt{x}} \\ = (x + x^{1/2})^{1/2}$$

$$y' = \frac{1}{2}(x + x^{1/2})^{-1/2} \left(1 + \frac{1}{2}x^{-1/2}\right)$$

$$7) y = \sin(x \cdot \tan(x))$$

$$\begin{aligned} y' &= \cos(x \cdot \tan(x)) (x \cdot \tan(x))' \\ &= \cos(x \cdot \tan(x)) ((1)\tan(x) + x(\sec^2(x))) \\ &= \cos(x \cdot \tan(x)) (\tan(x) + x \cdot \sec^2(x)) \end{aligned}$$