(8) $Q(t) = 200(30-t)^2$

a. instantaneous velocity at $t=10$

$200(900 - 60t + t^2)$

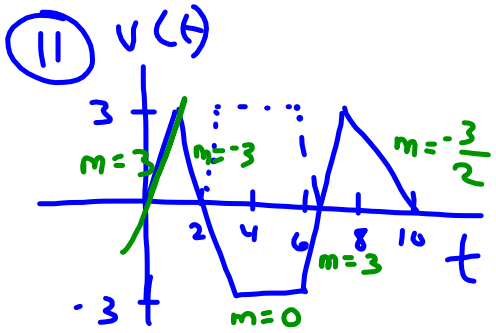
$Q(t) = 180000 - 12000t + 200t^2$

$-12000 + 400t$

$-12000 + 4000 = -8000$

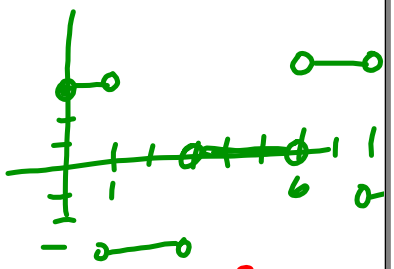
b. $(0, 180000)$

$(10, 80000)$

(11) 

a. $t=2, t=7$

b. $3<t<6$

d. 

(14) Mars: $s = 1.86t^2$

$s' = 3.72t$

$16.6 = 3.72t$

24) $v(t) = 2t^3 - 9t^2 + 12t - 5$

$a(t) = 6t^2 - 18t + 12 = 0$

$t^2 - 3t + 2 = 0$

$t = 1, 2$ $(t-2)(t-1) = 0$

3.5 (8) $y = \frac{x}{1+\cos x}$

$y' = \frac{1(1+\cos x) - x(-\sin x)}{(1+\cos x)^2}$

$= \frac{1 + \cos x + x\sin x}{(1+\cos x)^2}$

(21) $y = \sin x + 3$ at $x = \pi$

point: $(\pi, 3)$

$y' = \cos x$ $m = -1$

tangent $y - 3 = -1(x - \pi)$

normal $m = 1$ $y - 3 = 1(x - \pi)$

Derivative Quiz - Find the derivative of each function.

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

$x^2 - x + 1$

2. $f(x) = \frac{2x+1}{x^2-1}$

$\frac{-2x^2+2x-2}{(x^2-1)^2}$

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

$4x - 5$

4. $f(x) = \frac{x^2+1}{x^2}$

$\frac{x^2}{x^2} + \frac{1}{x^2}$

$\frac{-2}{x^3}$

5. $f(x) = x^2 + \frac{1}{x^2}$

x^{-2} $-2x^{-3}$

$2x - \frac{2}{x^3}$

6. $g(x) = x^2\sqrt{3-x}$

$\frac{2x(x^2) - (x^2+4)(2x)}{x^4}$

$\frac{-2x}{x^4}$

3.6 Chain Rule

When taking the derivatives of a function which is made up of the composite of 2 or more functions, take the derivative of the "outermost" function and work in.

$f(x) = (x^2+1)^5$

$g(x) = x+1$

$f(g(2))$

Composite Functions

$h(x) = (3x + 1)^5$

$h'(x) = 5(3x+1)^4 \cdot 3$

$= 15(3x+1)^4$

A composite function is a function that is made up of 2 or more functions "nestled" inside of each other.

3x+1 is "nestled" inside of x^5

If f(x)=3x+1 and g(x)=x^5, then h(x)=~~f(g(x))~~ g(f(x)).

Find the derivative

1.) $y=\sin(3x+5)$

$y' = \cos(3x+5) \cdot 3$

$= 3\cos(3x+5)$

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2.) $f(x) = (5x+7)^8$

$f'(x) = 8(5x+7)^7 \cdot 5$

$= 40(5x+7)^7$

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3.) $f(x) = \tan(x^2 + 1)$

$f'(x) = \sec^2(x^2+1) \cdot 2x$

$= 2x \sec^2(x^2+1)$

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4.) $g(x) = \cos^2(4x-6)$

$= (\cos(4x-6))^2$

$g'(x) = 2\cos(4x-6) \cdot (-\sin(4x-6)\cdot 4)$

$= -8\cos(4x-6)\sin(4x-6)$

$\frac{d}{dx}\cos(4x-6) = -\sin(4x-6)\cdot 4$

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5.) $y = \sqrt{\tan x}$

$= (\tan x)^{1/2}$

$y' = \frac{1}{2}(\tan x)^{-1/2} \cdot \sec^2 x$

$= \frac{\sec^2 x}{2\sqrt{\tan x}}$

6.) $y = x^2 \cos(4x^3 - 5x)$

$f(x) = x^2$ $\quad g(x) = \cos(4x^3 - 5x)$

$f'(x) = 2x$ $\quad g'(x) = -\sin(4x^3 - 5x) \cdot (12x^2 - 5)$

$x^2(-\sin(4x^3 - 5x)(12x^2 - 5) + 2x\cos(4x^3 - 5x)$

7.) $y = \sec\left(\frac{x^2}{x^3 + 1}\right)$

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8.) $y = \sin(x^2 \sec x)$

9.) $y = \dfrac{x^3}{\sin(x^2)}$

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Ex2. Find the equation of the line tangent to $y = \cos^4 x$ at $x = \frac{\pi}{6}$

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Homework

pg 153 #11-19, 21, 22, 25, 27, 29, 33, 56, 58, 62, 63, 72, 73

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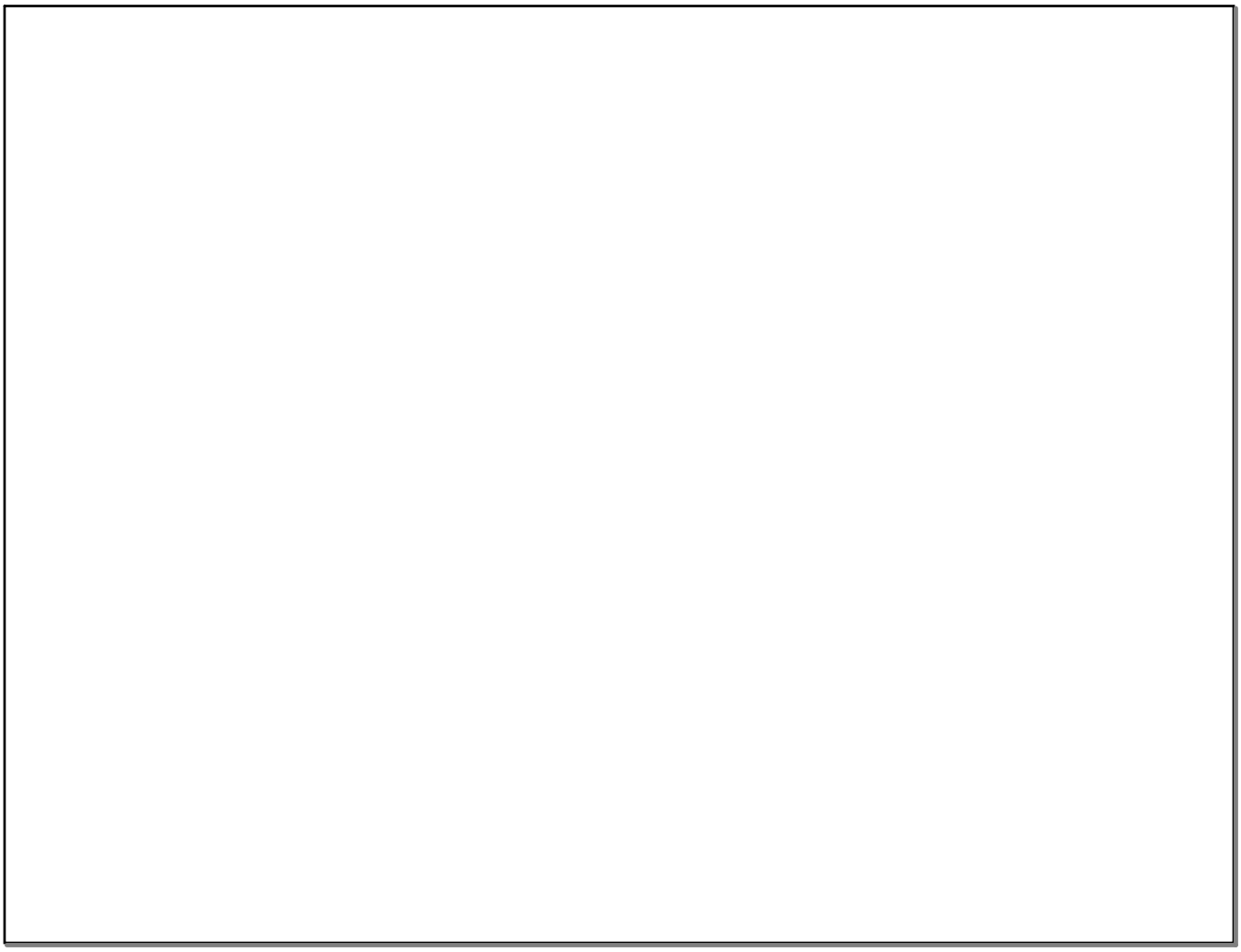

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