Name:

"And I knew exactly what to do. But in a much more real sense, I had no idea what to do."
-Michael Scott, The Office

Collaborators:

Section Day/Time:

Derivatives: Chain Rule and Implicit Differentiation

Webwork Week 5, Selected Problems

7. If $f(3) = -5$, $g(3) = 9$, $f'(3) = 4$, and $g'(3) = -8$, find the following numbers:

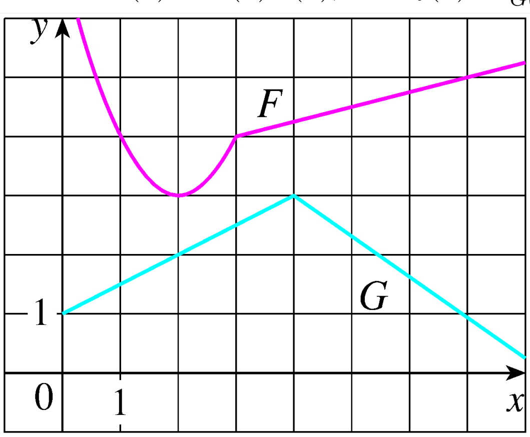
a) $(f+g)'(3)$

b) $(fg)'(3)$

c) $(f/g)'(3)$

d) $\left(\frac{f}{f-g}\right)'(3)$

9. Let $P(x) = F(x)G(x)$, and $Q(x) = \frac{F(x)}{G(x)}$, where F and G are as below. Find $P'(2)$ and $Q'(7)$.



52. If $r(x) = f(g(h(x)))$, where $h(1) = 2$, $g(2) = 3$, $h'(1) = 4$, $g'(2) = 5$, and $f'(3) = 6$, find $r'(1)$.

54. By writing $|x| = \sqrt{x^2}$ and using the Chain Rule, one can verify that $\frac{d}{dx}|x| = x|x|$.

a) If $f(x) = |\sin(x)|$, find $f'(x)$.

b) Where is $f(x)$ not differentiable? Give only the smallest positive value of x.

c) If $g(x) = \sin|x|$, find $g'(x)$.

d) Where is $g(x)$ not differentiable?

Group Work

Trig Rules

$\dfrac{d}{dx}\sin(x) =$	$\dfrac{d}{dx}\cot(x) =$
$\dfrac{d}{dx}\cos(x) =$	$\dfrac{d}{dx}\sec(x) =$
$\dfrac{d}{dx}\tan(x) =$	$\dfrac{d}{dx}\csc(x) =$

Chain Rule

If $F(x) = (f \circ g)(x) = f(g(x))$, then $F'(x) =$

If $y = f(u)$ and $u = g(x)$ are both differentiable functions, then

$$\frac{dy}{dx} =$$

1. Use the Chain Rule to compute the following derivatives:

a) $h(t) = \left(\dfrac{2t+3}{6-t^2}\right)^3$

b) $f(t) = \sin(3t^2 + t)$

c) $y = \sec(1 - 5x)$

d) $G(x) = \sin(xe^x)$

2. Do each of the following for the equation $x^2 + y^3 = 4$:

a) Find y' by solving the equation for y and differentiating directly.

b) Find y' by implicit differentiation

c) Check that your answers to (a) and (b) are the same.

d) Find the equation of the line tangent to the curve $x^2 + y^3 = 4$ when $x = \sqrt{3}$.

3. Use implicit differentiation to find an equation of the tangent line to the curve $x^2 + y^2 = (2x^2 + 2y^2 - x)^2$ at the point $\left(0, \frac{1}{2}\right)$, that is, when $x = 0$ and $y = \frac{1}{2}$.