

Announcements! Exam starting Friday going through weekend!

No quiz Thursday!

Only material up to section 4.1 is covered on Exam (HW to Monday)
multiple choice comes from graphs likely
maybe short answer

Review sessions w/ Dr. Farthing Wed & Fri.

Next HW due Thurs. March 4
+ quiz

Know defn of continuity/derivative

Write out Rules

1) Find the derivative of the following functions.

a) $y = (7x-6)^2 = 49x^2 - 42x - 42x + 36 = 49x^2 - 84x + 36$

$y' = 98x - 84$

or product rule

$\rightarrow y' = 7(7x-6) + 7(7x-6) = 48x - 84$

b) $f(x) = (\sqrt{x} - 2)(3x^2 + x + 1) = (x^{1/2} - 2)(3x^2 + x + 1)$

$y' = \frac{1}{2}x^{-1/2}(3x^2 + x + 1) + (x^{1/2} - 2)(6x + 1)$

product rule

$= \frac{3}{2}x^{3/2} + \frac{1}{2}x^{1/2} + \frac{1}{2}x^{-1/2} + 6x^{3/2} + x^{1/2} - 12x - 2$

$= \frac{15}{2}x^{3/2} - 12x + \frac{3}{2}x^{1/2} - 2 + \frac{1}{2}x^{-1/2}$

c) $g(x) = \frac{-8x}{2x^2 + 1}$

quotient rule

$g'(x) = \frac{-8(2x^2 + 1) + (8x)(4x)}{(2x^2 + 1)^2} = \frac{-16x^2 - 8 + 32x^2}{(2x^2 + 1)^2} = \frac{16x^2 - 8}{(2x^2 + 1)^2} = \frac{8(2x^2 - 1)}{(2x^2 + 1)^2}$

d) $r(t) = \frac{2t^3 - 5t^2}{t + 2}$

$r'(t) = \frac{(6t^2 - 10t)(t + 2) - (2t^3 - 5t^2)(1)}{(t + 2)^2} = \frac{6t^3 + 12t^2 - 10t^2 - 20t - 2t^3 + 5t^2}{(t + 2)^2}$

$= \frac{4t^3 + 7t^2 - 20t}{(t + 2)^2}$

e) $y = \frac{3w^3 - w^2 + 4w - 1}{\sqrt[3]{w}} = \frac{3w^3 - w^2 + 4w - 1}{w^{1/3}} = \frac{3w^{9/3} - w^{6/3} + 4w^{3/3} - 1}{w^{1/3}} = \frac{3w^{8/3} - w^{5/3} + 4w^{2/3} - 1}{w^{1/3}}$

$y' = 8w^{5/3} - \frac{5}{3}w^{2/3} + \frac{8}{3}w^{-1/3} + \frac{1}{3}w^{-4/3}$

$= \frac{8w^{9/3} - \frac{5}{3}w^{6/3} + \frac{8}{3}w^{3/3} + \frac{1}{3}}{w^{4/3}} = \frac{8w^3 - \frac{5}{3}w^2 + \frac{8}{3}w + \frac{1}{3}}{w^{4/3}}$

Quotient Rule $y' = \frac{(9w^2 - 2w + 4)w^{1/3} - \frac{1}{3}(3w^3 - w^2 + 4w - 1)w^{-2/3}}{w^{2/3}}$

$= \frac{9w^{7/3} - 2w^{4/3} + 4w^{1/3} - w^{7/3} + \frac{1}{3}w^{4/3} - \frac{4}{3}w^{1/3} + \frac{1}{3}w^{-2/3}}{w^{2/3}}$

$= \frac{8w^{7/3} - \frac{5}{3}w^{4/3} + \frac{8}{3}w^{1/3} + \frac{1}{3}w^{-2/3}}{w^{2/3}} = \frac{8w^{9/3} - \frac{5}{3}w^{6/3} + \frac{8}{3}w^{3/3} + \frac{1}{3}}{w^{4/3}} = \frac{8w^3 - \frac{5}{3}w^2 + \frac{8}{3}w + \frac{1}{3}}{w^{4/3}}$

2. Let $f(x) = e^x$, $g(x) = \cos(x)$, $h(x) = x^2$ and $k(x) = 2x+4$. Give expressions for the following. (Identify the inner & outer functions.)

a) $(f \circ g)(x)$
 $= e^{\cos(x)}$

I: $g(x)$
 O: $f(x)$

b) $(g \circ f)(x)$
 $= \cos(e^x)$

I: $f(x)$
 O: $g(x)$

c) $(h \circ f)(x)$
 $= (e^x)^2 = e^{2x}$

I: $f(x)$
 O: $h(x)$

d) $(f \circ h)(x)$
 $= e^{x^2}$

I: $h(x)$
 O: $f(x)$

e) $(h \circ k)(x)$
 $= (2x+4)^2$
 $= 4x^2 + 16x + 16$

I: $k(x)$
 O: $h(x)$

f) $(f \circ k)(x)$
 $= e^{2x+4}$

I: $k(x)$
 O: $f(x)$

g) $(f \circ k \circ h)(x)$
 $= f(2x^2+4)$
 $= e^{2x^2+4}$

h) $(k \circ g \circ h)(x)$
 $= k(\cos(x^2))$
 $= 2\cos(x^2) + 4$

3) For each of the functions given, find two functions $f(x)$ and $g(x)$ so that $h(x) = (f \circ g)(x)$

a) $h(x) = \sqrt{x^2 - 9}$

I: $x^2 - 9$

O: $\sqrt{x}$

$f(x) = \sqrt{x}$

$g(x) = x^2 - 9$

b) $h(x) = (x^5 - 4x^3 + 7)^{100}$

I: $x^5 - 4x^3 + 7$

O: x^{100}

$f(x) = x^{100}$

$g(x) = x^5 - 4x^3 + 7$

c) $h(x) = \cos(\sin(x))$

I: $\sin(x)$

O: $\cos(x)$

$f(x) = \cos(x)$

$g(x) = \sin(x)$

d) $h(x) = e^{4x+2}$

I: $4x+2$

O: e^x

$f(x) = e^x$

$g(x) = 4x+2$

I: $x+1$

O: e^{2x}

$f(x) = 2x$

$g(x) = x+1$

Extra Practice Problems:

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

2. $p(x) = (y^{-1} + y^{-2})(2y^{-3} - 5y^{-4})$

3. $f(t) = \frac{4t^2 + 11}{t^2 + 3}$

4. $r(t) = \frac{\sqrt{t}}{2t+3}$