Calculus I - MAC 2311

Homework - Review Test 2

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Ex 1. (20 points) Compute the derivatives of the following functions (and show your work):

a) $f(x) = \sqrt{x} + \dfrac{1}{x} + 8$

b) $f(x) = \cos(x^8)$

c) $f(x) = \cos^8(x)$

d) $f(t) = \sqrt{t^5}$

e) $f(x) = \dfrac{1}{\sqrt{\pi}}$

f) $f(x) = x^2 \ln(x)$

g) $f(x) = \dfrac{e^x}{\sin(3x)}$

h) $f(x) = e^{\ln(\sin(x))}$

i) $f(x) = \sin(\tan(8x))$

j) $f(u) = e^u \cos(u) \tan(u)$

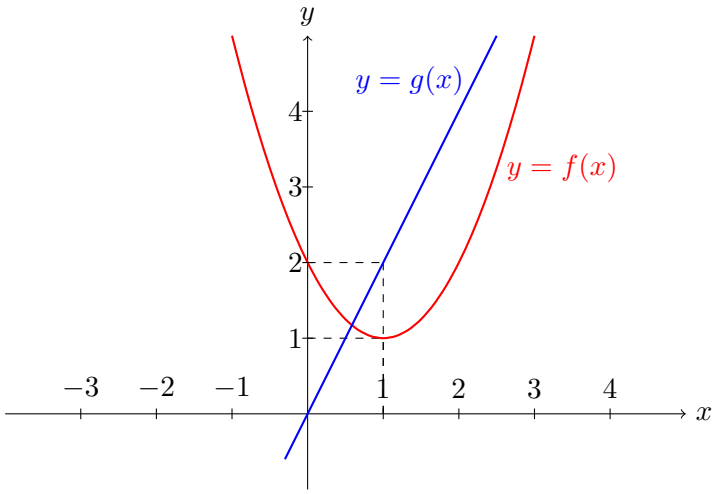
Ex 2. (10+10 points) Consider the curve given by the equation

$$x^2y^2 + xy = 2.$$

a) Use implicit differentiation to find y' (i.e. $\frac{dy}{dx}$).

b) Find an equation of the tangent line to the above curve at the point $(1, 1)$.

Ex 3. (5+5+5+5 points)



Let f and g be the functions whose graphs are shown above and let

$$h(x) = f(x) + g(x), \qquad u(x) = f(x)g(x), \qquad v(x) = \frac{f(x)}{g(x)}, \qquad w(x) = g(f(x)).$$

Compute $h'(1)$, $u'(1)$, $v'(1)$ and $w'(1)$.

Ex 4. (5+5+10 points) A couple of alligators meets at the intersection of Bruce B. Downs Blvd and Fowler Ave for organizing a romantic dinner. The male alligator starts running east at a speed of 0.4 miles per minute to chase a USF student. At the same time the female alligator starts running north at a speed of 0.3 miles per minute to chase a USF instructor.

At a given time t (measured in minutes), let $x(t)$ be the distance between the male alligator and the intersection point, $y(t)$ be the distance between the female alligator and the intersection point and $z(t)$ be the distance between the two alligators.

a) Find an equation that relates $x(t), y(t)$ and $z(t)$.

b) Compute $x(5)$, $y(5)$ and $z(5)$.

c) At what rate is the distance between the two alligators increasing after 5 minutes?

Ex 5. (5+5+5+5 points) Which statements are True/False? Justify your answers.

a) If $f(0) = g(0)$ then $f'(0) = g'(0)$.

b) If $f(x) = \cos(x)$ then $f''(0) = 0$.

c) If the graphs of two functions f and g have the same tangent line at 0 then $f'(0) = g'(0)$.

d) The function $f(x) = |x - 2|$ is differentiable at 2 since it is continuous at 2.