TMATH 124: Quiz 3

You may use any work of yours that you made from last week. This includes, practice book problems and worked out WebAssign problems. This does not include photocopies of notes from the book or tutorials shown on WebAssign. Graphing calculators are also not allowed. In short, you are only allowed to use work that you created.

Show all your work (numerically, algebraically, or geometrically) for each and simplify. No credit is given without supporting work.

1. Differentiate each of the following & simplify to the point that there is no denominator.

\[ y = (x^2 - 2x)e^x \]

\[ y' = e^x (x^2 - 2x)' + (e^x)'(x^2 - 2x) \]

\[ = e^x (2x - 2) + e^x (x^2 - 2x) \]

\[ = e^x (x^2 - 2) \]

Product rule: 1.5

Plug in wrongly: 1.5

\[ y = \frac{x^2 - 2\sqrt{x}}{x} \]

\[ y' = \frac{1 - 2(-\frac{1}{2})x^{-\frac{3}{2}}}{x^{-1}} = 1 + \frac{-3}{2} \]

Quotient rule: 1.5

Plug in rightly: 1.5

\[ y = \cos x \sin x \]

\[ y' = \frac{\sin x (\cos x)' - \cos x (\sin x)'}{\sin^2 x} \]

\[ = -\frac{\sin x \sin x - \cos x \cos x}{\sin^2 x} \]

\[ = -\frac{1}{\sin^2 x} \]

Pythag. 4.5

\[ = -\csc^2 x \]

Simplifying: 1

\[ y' = 1 - 2x^{\frac{3}{2}} \]

\[ = 1 - x^3 \]

\[ = 1 - x^\frac{3}{2} \]
2. Suppose that \( f(5) = 1, f'(5) = 6, g(5) = -3, \) and \( g'(5) = 2. \) Let \( P \) be the function defined as \( fg. \)

(a) Find \( P'(5). \)

\[
P'(5) = f(5)g'(5) + f'(5)g(5)
= 1 \cdot 6 + 6 \cdot (-3)
= 6 - 18
= -12
\]

(b) Find the equation of the line tangent to the graph of \( P \) when \( x = 5. \)

-looking for \( y = mx + b \n \)

\[ m = P'(5) = -12 \]

then \( (5, P(5)) = (5, f(5)g(5)) = (5, 1 \cdot -3) = (5, -3) \)

\[ -3 = -12(5) + b \]

\[ b = -3 + 60 = 57 \]

so \( y = -12x + 57 \)