MATH 100 – WORKSHEET 5
THE DERIVATIVE

1. LINEAR COMBINATIONS; POWER LAWS

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(1) If f, g are functions and a, b are numbers then $(af + bg)' = af' + bg'$

(2) $\frac{d}{dx}(x^r) = rx^{r-1}$ (3) $\frac{d}{dx}(e^x) = e^x$.

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(1)

    (a) Differentiate $f(x) = \frac{5x^3 - 2x + 1}{\sqrt{x}}$.

    (b) Let $g(x) = Ax^{5/2} + x^2$. Suppose that $g'(4) = 0$. What is A?

(2) Find the *second* derivative of

    (a) $5e^x$

    (b) $\sqrt{x} + 5e^x$

(3) The line $y = 5x + B$ is tangent to the curve $y = x^3 + 2x$. What is B?

Fact. $(fg)' = f'g + fg'$, $\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$

(1) Find $\frac{\mathrm{d}}{\mathrm{d}x}\left(x^a e^x\right)$.

(2) Suppose that $f(1) = 1$, $g(1) = 2$, $f'(1) = 3$, $g'(1) = 4$. Find $(fg)'(1)$ and $\left(\frac{f}{g}\right)'(1)$.

(3) $f(x) = \frac{x^2 + A}{\sqrt{x}}$. $f'(x) =$

(4) Let $f(x) = \frac{x}{\sqrt{x} + A}$. Given that $f'(4) = \frac{3}{16}$, give a quadratic equation for A.