Algebra Review

(1) Definition of the logarithm: $\log_a x = y$ iff

(2) Change of Base Formula: $\log_a u =$

(3) Exponential Formula: $u^w =$

Calculus Formulas

(1) $\dfrac{d}{dx}(e^x) =$

(2) $\dfrac{d}{dx}(\ln x) =$

> **Remark 5.2.1.** *The domain of $f(x) = \ln x$ is $x > 0$, so the domain of $f'(x)$ is*

(3) $\dfrac{d}{dx}(\log_a x) =$

(4) $\dfrac{d}{dx}(a^x) =$

Examples

Example 5.2.1. *If $f(x) = 2e^x + 5\ln x$, find $f'(x)$*

Example 5.2.2. *Find the derivative of $y = e^{3x^2} + \ln(4x^5)$*

Example 5.2.3. *If $f(x) = x^e + e^x$, find $f'(x)$*

Example 5.2.4. *If $f(x) = e^2 + \ln 2$, find $f'(x)$*

Example 5.2.5. *If $f(x) = 2x^3 - e^7 - 5x^c + 4e^x$, find $f'(x)$*

Example 5.2.6. *If $f(x) = -4\ln x - \ln 6 + 4x^5$, then $f'(x)$ equals*

(1) $-\frac{4}{x} - \frac{1}{6} + 20x^4$
(2) $-\frac{1}{4x} - \frac{1}{6} + 20x^4$
(3) $-\frac{x}{4} + 20x^4$
(4) $-\frac{4}{x} + 20x^4$
(5) none of these

Example 5.2.7. *If $f(x) = x^{10} \ln x$, then $f'(x)$ equals*

Example 5.2.8. *Find the derivative of $y = e^{2x} \ln(x^3)$*

Example 5.2.9. *Find the derivative of $f(x) = \dfrac{e^x}{3x - 5x^2}$*

Example 5.2.10. *Find the equation of the tangent line to the graph of $y = 4 \ln x$ when $x = 3$.*

Example 5.2.11. *Select ALL the correct choices regarding the absolute maximum of $f(x) = 3x - 2x \ln x$ on $(0, \infty)$.*

> *(1) max at $x = e^{\frac{1}{2}}$*
> *(2) max of $2e^{\frac{1}{2}}$*
> *(3) max at $x = 2e^{\frac{1}{2}}$*
> *(4) max of $e^{\frac{1}{2}}$*
> *(5) there is no absolute max*

Example 5.2.12. *Select ALL the correct choices for* $f(x) = (x - 7)e^x$.

    (1) $f(x)$ is increasing on $(5, \infty)$
    (2) $f(x)$ is decreasing on $(6, \infty)$
    (3) the graph of $f(x)$ is concave up on $(6, \infty)$
    (4) the graph of $f(x)$ has an inflection point at $x = 5$
    (5) $f(x)$ has an absolute max at $x = 6$
    (6) $f(x)$ has an absolute min at $x = 5$

Example 5.2.13. *The demand for souvenir T-shirts sold by a nendor at the Civic Center is given approximately by $p = 15 - 4\ln x$, $12 \leq x \leq 40$, where x is the number of T-shirts (in thousands) that can be sold at a concert at a price $\$p$. If the wholesale cost of the T-shirts is $\$5$ each, find the profit function, $w(x)$ (in thousands of dollars).*

    (1) $w(x) = 15x - 4x\ln x - 5$
    (2) $w(x) = 10x - 4\ln x^2$
    (3) $w(x) = 10x - 4x\ln x$
    (4) $w(x) = 15x - 4x\ln x$
    (5) none of these

Example 5.2.14. *Find the maximum profit in the previous problem.*

Homework: 5.2 p. 330 # 3, 7, 13, 19, 29, 33, 35, 43, 63 work e-grade practice at least 2 times.