ONE-PAGE REVIEW

MATH 1910 Recitation

§7.1 (Exponential Functions), §7.2 (Inverse functions), §7.3 (Logarithms)

September 29, 2016

(1) $f(x) = b^x$ is increasing if $\boxed{}^{(1)}$ and decreasing if $\boxed{}^{(2)}$.

(2) The derivative of $f(x) = b^x$ is $\frac{d}{dx}b^x = \boxed{}^{(3)}$.

(3) $\dfrac{d}{dx}e^x = \boxed{}^{(4)}$ and $\dfrac{d}{dx}e^{f(x)} = \boxed{}^{(5)}$ and $\dfrac{d}{dx}e^{kx+b} = \boxed{}^{(6)}$.

(4) $\displaystyle\int e^x\,dx = \boxed{}^{(7)}$ and $\displaystyle\int e^{kx+b} = \boxed{}^{(8)}$ for constants k, b.

(5) A function f with domain D is **one to one** if $\boxed{}^{(9)}$

(6) Let f have domain D and range R. The **inverse** f^{-1} is the unique function with domain R and range D such that $\boxed{}^{(10)}$.

(7) The inverse of f exists if and only if f is $\boxed{}^{(11)}$ on its domain.

(8) **Horizontal Line Test:** f is one-to-one if and only if every horizontal line $\boxed{}$

(9) To find the inverse function, solve $y = f(x)$ for $\boxed{}^{(13)}$ in terms of $\boxed{}^{(14)}$.

(10) The graph of f^{-1} is obtained by $\boxed{}^{(15)}$ the graph of f through the line $\boxed{}^{(16)}$.

(11) If f is differentiable and one-to-one with inverse g, then for x such that $f'(g(x)) \neq 0$,

$$g'(x) = \frac{1}{f'(g(x))}.$$

(12) The inverse of $f(x) = b^x$ is $\boxed{}^{(17)}$.

(13) Logarithm Rules

(a) $\log_b(1) = \boxed{}^{(18)}$ and $\log_b(b) = \boxed{}^{(19)}$.

(b) $\log_b(xy) = \boxed{}^{(20)}$ and $\log_b\left(\frac{x}{y}\right) = \boxed{}^{(21)}$

(c) **Change of Base:** $\dfrac{\log_a(x)}{\log_a(b)} = \boxed{}^{(22)}$.

(d) $\log_b(x^n) = \boxed{}^{(23)}$.

(14) $\dfrac{d}{dx}\ln(x) = \boxed{}^{(24)}$ and $\dfrac{d}{dx}\log_b(x) = \boxed{}^{(25)}$

(15) $\displaystyle\int \frac{1}{x}\,dx = \boxed{}^{(26)}$.

Handout format by Drew Zemke

Practice Problems

MATH 1910 Recitation

§7.1 (Exponential Functions), §7.2 (Inverse functions), §7.3 (Logarithms)

September 29, 2016

(1) Calculate the derivative.

(a) $f(x) = 7e^{2x} + 3e^{4x}$

(b) $f(x) = e^{e^x}$

(c) $f(x) = 3^x$

(d) $f(t) = \dfrac{1}{1 - e^{-3t}}$

(e) $f(t) = \cos(te^{-2t})$

(f) $\displaystyle\int_4^{e^x} \sin t \, dt$

(g) $f(x) = x \ln x$

(h) $f(x) = \ln(x^5)$

(i) $f(x) = \ln(\sin(x) + 1)$

(j) $f(x) = e^{\ln(x)^2}$

(k) $f(x) = \log_a(\log_b(x))$

(l) $f(x) = 16^{\sin x}$

.

(2) Calculate the integral.

(a) $\displaystyle\int (e^x + 2) \, dx$

(b) $\displaystyle\int \frac{7}{x} \, dx$

(c) $\displaystyle\int e^{4x} \, dx$

(d) $\displaystyle\int \frac{\ln x}{x} \, dx$

(e) $\displaystyle\int \frac{1}{9x - 3} \, dx$

(f) $\displaystyle\int_2^3 (e^{4t-3}) \, dt$

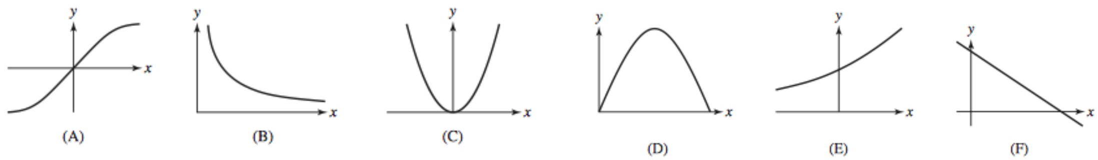
(g) $\displaystyle\int e^t \sqrt{e^t + 1} \, dt$

(h) $\displaystyle\int e^x \cos e^x \, dx$

(i) $\displaystyle\int \tan(4x + 1) \, dx$

(j) $\displaystyle\int x 3^{x^2} \, dx$

(3) For each function shown below, sketch the graph of the inverse.



(4) Calculate $g(b)$ and $g'(b)$, where g is the inverse of f.

(a) $f(x) = x + \cos x$, $b = 1$.

(b) $f(x) = 4x^3 - 2x$, $b = -2$.

(c) $f(x) = \sqrt{x^2 + 6x}$ for $x \geq 0$, $b = 4$.

(d) $f(x) = \frac{1}{x+1}$, $b = \frac{1}{4}$.

(5) Which of the following statements are true and which are false? If false, modify the statement to make it correct.

(a) If f is increasing, then f^{-1} is increasing.

(b) If f is concave up, then f^{-1} is concave up.

(c) If f is odd then f^{-1} is odd.

(d) Linear functions $f(x) = ax + b$ are always one-to-one.

(e) $f(x) = \sin(x)$ is one-to-one.