5.4 Notes and Examples

Name: Block: Seat:

5.4: Exponential Functions: Differentiation and Integration

Definition and Properties

1. The Natural Exponential Function _______ is the _______________ function of the Natural ______________ function ______________
2. ______________ if and only if ______________
3. $e^a e^b =$ _____________
4. $\frac{e^a}{e^b} =$ _____________
5. $(e^a)^b =$ _____________
6. The domain of e^x is ________________ and the Range is _____________________
7. The function e^x is
   (a) _____________________
   (b) _____________________
   (c) _____________________, (that is _____________________)
8. The graph of e^x is always concave _____________________
9. $\lim_{x\to-\infty} e^x =$ ____________ and $\lim_{x\to\infty} e^x =$ ____________
10. $\frac{d}{dx}e^x =$ ____________ and $\frac{d}{dx}e^u =$ ____________
11. $\int e^x\, dx =$ ____________ and $\int e^u\, du =$ ____________

1. Review
   (a) Solve $7 = e^{x+1}$

2. Differentiation

   (a) If $f(x) = e^{-3/x}$ find $f'(x)$

   (b) If $f(x) = x^2 e^x$ find $f'(x)$

3. Find the relative extrema of $f(x) = xe^x$

4. The spread of a flu in a certain school is modeled by $P(t) = \dfrac{100}{1 + e^{3-t}}$, where $P(t)$ is the total number of students infected t days after the flu was first noticed.

   (a) Estimate the initial number of students infected by the flu.

   (b) How fast is the flu spreading after 3 days?

5. Integration

(a) $\int e^{4x-7}\ dx =$

(b) $\int \cos x \cdot e^{\sin x}\ dx =$

(c) $\int \frac{e^{1/x}}{x^2}\ dx =$

(d) $\int \frac{e^x}{2+e^x}\ dx =$

(e) $\int e^x \cos(e^x)\ dx =$

6. Definite Integrals

(a) $\int_0^1 e^{-x}\ dx =$

(b) $\int_0^1 \frac{e^x}{1+e^x}\ dx =$

(c) $\int_{-1}^0 e^x \cos(e^x)\ dx =$