Name:_____ **7/3/2018**

Math 202 Calculus II **Midterm Exam**

Please show all work and box your final answers. If you need more room, you may use the backs of the pages. Calculators are not allowed. Good luck!

1. Let f be the one-to-one function $f(x) = 2x^3 + 3x^2 + 7x + 4$. Find $(f^{-1})'(4)$.

2. State the domain of the function $f(x) = \dfrac{e^{x-1}}{(\ln x)(1 - \ln x)}$.

3. For each of the following, find $\dfrac{dy}{dx}$.

(a) $y = x^{\sqrt{x}}(x^{\ln x})$

(b) $y = e^{\arctan^2 x}$

(c) $y = \dfrac{5^x \sqrt[4]{x^3}}{x^7(x+1)^2}$

4. Suppose a colony of bacteria grows according to the law of *natural decay*. Initially, the colony contains 2400 bacteria, and 3 days later the colony contains 6000 bacteria. How long will it take the population to grow from 2400 bacteria to 9600 bacteria?

5. Derive the derivative $\dfrac{d}{dx}\left[\sec^{-1} x\right]$.

6. Evaluate the following limits.

(a) $\lim_{x \to \infty} \dfrac{\cosh(1/x)}{e^{1/x}}$

(b) $\lim_{x \to 0} \dfrac{5^x - 4^x}{3^x - 2^x}$

(c) $\lim_{x \to 0^+} (\cos x)^{1/x^2}$

7. Evaluate the following integrals.

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

(b) $\int \tan^5 \pi\theta \, d\theta$

8. Evaluate the following integrals.

(a) $\displaystyle\int_0^{2\sqrt{3}} \frac{x^3}{\sqrt{16-x^2}}\,dx$

(b) $\displaystyle\int \frac{x^2+2x-1}{x^3-x}\,dx$