

Quiz 5
 MATH 022, Section 004
 University of California, Riverside
 November 15, 2018

This quiz is worth 15 points. You have 30 minutes to complete the quiz. If you need more space, continue your work on the back side of the page and write "see back" next to your work on the front side of the page accordingly.

(2 pts) 1. Use properties of exponents to simplify:

(a) $(e^3)^4$
 $(e^3)^4 = e^{3 \cdot 4} = e^{12}$

(b) $(e^3)^{-2}$
 $(e^3)^{-2} = e^{3 \cdot (-2)} = e^{-6}$

(4 pts) 2. Find an equation of the tangent line to the graph of $y = x \ln x$ at the point (e, e) .

$$y' = \frac{d}{dx}(x \ln x)$$

$$= \frac{d}{dx}(x) \cdot \ln x + x \cdot \frac{d}{dx}(\ln x)$$

$$= 1 \cdot \ln x + x \cdot \frac{1}{x}$$

$$= \ln x + 1$$

~~$y'(e) = \ln e + 1$~~
 $y'(e) = \ln e + 1$
 $= 1 + 1$
 $= 2$

$y - e = 2(x - e)$
 $y - e = 2x - 2e$
 $y = 2x - e$

(2 pts) 3. On the day of a child's birth, a deposit of \$20,000 is made in a trust fund that pays 8% interest, compounded continuously. Determine the balance in this account on the child's 21st birthday.

$A = Pe^{rt}$
 $A = (20000)e^{(0.08)(21)}$
 $P = \$20,000$
 $r = 0.08$
 $t = 21 \text{ years}$

(3 pts) 4. Evaluate $\int \frac{2x^3 - 1}{x^3} dx$.

$$\int \frac{2x^3 - 1}{x^3} dx = \int \frac{2x^3}{x^3} - \frac{1}{x^3} dx$$

$$= \int 2 - x^{-3} dx$$

$$= 2x - \frac{x^{-3+1}}{-3+1} + C$$

$$= 2x + \frac{x^{-2}}{2} + C = 2x + \frac{1}{2x^2} + C$$

(4 pts) 5. Evaluate $\int x^2(2x^3 - 1)^4 dx$.

$u = 2x^3 - 1$
 $du = 6x^2 dx \Rightarrow \frac{du}{6} = x^2 dx$

So $\int x^2(2x^3 - 1)^4 dx = \int u^4 \left(\frac{du}{6}\right) = \frac{1}{6} \int u^4 du = \frac{1}{6} \cdot \frac{u^5}{5} + C = \frac{1}{30} u^5 + C$

$= \frac{1}{30} (2x^3 - 1)^5 + C$