WORKSHEET 6

Problem 1. Calculate the derivatives of the following.

a) $f(x) = e^x \sqrt{3x+2}$

b) $f(x) = 7^{3x+1}$

c) $f(x) = 5^x \cdot 2^{\sqrt{t-2}}$

d) $f(x) = e^{x^2/(x^3+2)}$

e) $f(x) = \ln(4x - 3)$

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

Problem 2. Find the equation of the tangent line to $y = x \ln x$ through the point where $x = e$.

Problem 3. After the introduction of a product into the market, the percent of the public that is aware of the product is approximated by

$$A(t) = 10t^2 2^{-t},$$

where t is the time in months. Find the rate of change of the percent of the public that is aware of the products after 2 months and after 4 months.

Problem 4. The total revenue received from the sale of x items is given by $R(x) = 30 \ln(2x + 1)$ while the total cost to produce x items is $C(x) = x/2$.

a) Find the marginal revenue.

b) Find the profit function.

c) Find the marginal profit when 60 items are produced.

d) Interpret your answer to the previous part.

Problem 5. The population of a certain collection of rare Brazilian ants is given by

$$P(t) = (t + 100) \ln(t + 2),$$

where t represents the time in days. Find the rate of change of the population on the eighth day.

Problem 6. If a sum of \$1000 is deposited into an account that pays $r\%$ interest compounded continuously, the balance after 12 years is given by $A = 1000e^{12r/100}$. Find an interpret dA/dr when $r = 5$.

Problem 7. The length of the monkeyface prickleback, a West Coast game fish, can be approximated by

$$L = 71.5(1 - e^{0.1t})$$

and the weight by

$$W = 0.01289L^{2.9}$$

where L is length in centimeters, W the weight in grams, and t the age in years.

a) Find the approximate length of a 5-year-old monkeyface.

b) Find how fast the length of a 5-year-old monkeyface is growing.

c) Find the approximate weight of a 5-year-old monkeyface.

d) Find the rate of change of the weight *with respect to length* for a 5-year-old monkeyface.

e) Find how fast the weight of a 5-year-old monkeyface is growing.