

### Practice Problems for Midterm III

1. Solve for  $x$ .

- (a)  $e^x = 6$
- (b)  $7^{x+2} = 8^{5x}$
- (c)  $8 = A \times 2^{x/K}$  (A and K are constants.)

2. A certain radioactive isotope has a half-life of 3 years. The initial mass of this isotope is 12 grams.

- (a) What is the mass of the isotope 6 years later?
- (b) Write an equation for the mass of the isotope  $t$  years later.
- (c) How many years does it take for the mass of the isotope to reach 0.75 g?

3. The distance a car travels is given by the formula  $f(t) = t^2 + 2t$ . Some of the values of this function are given in the table below.

time ( $t$ )	1	1.1	1.5	2
distance ( $f(t)$ )	3	3.41	5.25	8

- (a) What is the average velocity of the car between (i)  $t = 1$  and  $t = 2$ ? (ii)  $t = 1$  and  $t = 1.5$ ? (iii)  $t = 1$  and  $t = 1.1$ ?
- (b) Use the power rule to find the derivative  $f'(t)$ .
- (c) What is the instantaneous velocity of the car at the time  $t = 1$ ?
- (d) When is the velocity of the car equal to 3?

4. Find the derivative  $f'(x)$  of each of the following functions.

- (a)  $f(x) = 3x^3 + 2x^2 + 5$
- (b)  $f(x) = x^{-\frac{3}{5}}$
- (c)  $f(x) = 3e^{2x}$
- (d)  $f(x) = \frac{1}{\sqrt{x}}(x + 1)$

5. Find the equation of the tangent line to the curve  $y = 3x^2 + x$  when  $x = 1$ .

6. Use the tangent line approximation to the curve  $y = e^x$  at  $x = 1$  to approximate the value of  $e^{1.2}$ .

7. If the temperature in Santa Barbara in the morning  $t$  hours after 6am is given by the formula  $f(t) = 50 + 2t^{\frac{3}{2}}$ , how quickly is the temperature increasing at 10 am?