

AP Calculus AB
AP Review #3

Name:

1. Let $H(m) = \frac{1}{4}(3+m^4)$.

a. Find $\frac{dH}{dt}$.

$$\frac{dH}{dt} = m^3 \frac{dm}{dt}$$

b. Find $\frac{dm}{dt}$ the instant when $m = -2$ and $\frac{dH}{dt} = 7$.

$$7 = (-2)^3 \frac{dm}{dt} \quad \frac{dm}{dt} = -\frac{7}{8}$$

2. Let $X(r) = 0.2e^{5r}$.

a. Find $\frac{dX}{dt}$.

$$\frac{dX}{dt} = e^{5r} \frac{dr}{dt}$$

b. Find $\frac{dr}{dt}$ the instant when $\frac{dX}{dt} = e^7$ and $r = 2$.

$$e^7 = e^{5 \cdot 2} \frac{dr}{dt} \quad \frac{dr}{dt} = e^{-3}$$

3. Let $A(x) = 2x^2 + y$.

a. Find $\frac{dA}{dt}$.

$$\frac{dA}{dt} = 4x \frac{dx}{dt} + \frac{dy}{dt}$$

b. Find $\frac{dy}{dt}$ the instant when $x = 4$, $y = -3$, $\frac{dA}{dt} = 0.4$, and $\frac{dx}{dt} = -\frac{1}{5}$

$$0.4 = 4 \cdot 4 \cdot \frac{1}{5} + \frac{dy}{dt} \quad \frac{dy}{dt} = 3.6$$

4. Let $R(a) = 5 \cos a + 3a^2$.

a. Find $\frac{dR}{dt}$.

$$\frac{dR}{dt} = -5 \sin a \frac{da}{dt} + 6a \frac{da}{dt}$$

b. Find $\frac{da}{dt}$ the instant when $\frac{dR}{dt} = -3$, and $a = \frac{2\pi}{3}$.

$$-3 = -5 \sin \frac{2\pi}{3} \frac{da}{dt} + 6 \cdot \frac{2\pi}{3} \frac{da}{dt}$$

$$-3 = +5 \cdot \frac{\sqrt{3}}{2} \frac{da}{dt} + 4\pi \frac{da}{dt}$$

$$\frac{da}{dt} = \frac{-3}{\frac{\sqrt{3}}{2} + 4\pi}$$

5. Let $\frac{dZ}{dt} = \cos 6t$. Find $\frac{d^2Z}{dt^2}$ when $t = \frac{2\pi}{3}$.

$$\frac{d^2Z}{dt^2} = -6 \sin 6t \quad \text{when } t = \frac{2\pi}{3}, \frac{d^2Z}{dt^2} = -6 \sin 4\pi = 0$$

6. Let $\frac{dP}{dt} = \frac{-3}{4}(5-6P)$. Find $\frac{d^2P}{dt^2}$ when $P = 7$.

$$\frac{dP}{dt} = \frac{18}{4} \frac{dP}{dt} \quad \text{when } P=7, \frac{dP}{dt} = 27.75, \frac{d^2P}{dt^2} = 124.875$$

7. Let $\frac{dh}{dt} = 4h^2 + 5t$. Find $\frac{d^2h}{dt^2}$ when $h = 4$ and $t = -3$.

$$\frac{d^2h}{dt^2} = 8h \frac{dh}{dt} + 5$$

when $h = 4, t = -3,$

$$\frac{dh}{dt} = 49, \frac{d^2h}{dt^2} = 1573$$

8. Let $\frac{dQ}{dt} = \sqrt{Q^2 + 6}$. Find $\frac{d^2Q}{dt^2}$ when $Q = 10$.

$$\frac{d^2Q}{dt^2} = \frac{1}{2} (Q^2 + 6)^{-1/2} \cdot 2Q \cdot \frac{dQ}{dt}$$

when $Q = 10,$

$$\frac{dQ}{dt} = \sqrt{106}, \frac{d^2Q}{dt^2} = 10$$

9. Let $\frac{dB}{dt} = e^B \ln(4+2B)$. Find $\frac{d^2B}{dt^2}$ when $B = 1$.

$$\frac{d^2B}{dt^2} = \frac{e^B \cdot 2 \cdot \frac{dB}{dt}}{4 + 2B} + \ln(4 + 2B) \cdot e^B \cdot \frac{dB}{dt}$$

when $B = 1, \frac{dB}{dt} = e \ln 6,$

$$\frac{d^2B}{dt^2} = \frac{e \cdot 2 \cdot e \ln 6}{6} + \ln 6 \cdot e \cdot e \ln 6$$