

Unit 3 Review

These problems provide an overview, but we recommend that you also review all homework problems from the unit.

Find the derivative...

$$\#1) g(x) = \frac{x^2 + 4x^{1/2}}{x^2}$$

$$\#2) s(t) = \frac{1-2t}{t^{1/2}}$$

$$\#3) H(t) = \sin t \sec^2 t$$

$$\#4) y = \sqrt{x^4 + 1}$$

$$\#5) y = (x^2 + 1)\sqrt[3]{x^2 + 2}$$

$$\#6) y = e^{\cos t}$$

$$\#7) y = 2^{\sin(\pi x)}$$

$$\#8) y = \cot^7(x^5)$$

$$\#9) f(t) = \sin^2(e^{\sin^2 t})$$

$$\#10) f(\theta) = \ln(\sin \theta)$$

$$\#11) G(s) = \ln^2(s)$$

$$\#12) f(x) = (5x^2 + 8)(x^2 - 4x - 6)$$

$$\#13) y = x^{\sqrt{x}}$$

$$\#14) y = \sin^{-1}(7x)$$

$$\#15) y = x^{\sec x}$$

$$\#16) y = \tan \sqrt{1 + \csc \theta}$$

$$\#17) y = \csc(a + \ln x)$$

Find the equation of the tangent line at the point specified...

$$\#18) y = e^x \cos x \text{ at } x = 0$$

$$\#19) y = \sin(\sin x) \text{ at } (\pi, 0)$$

$$\#20) x^2 + x \arctan y = y - 1 \text{ at } \left(-\frac{\pi}{4}, 1\right)$$

Implicit Differentiation...

$$\#21) \text{ If } y - x^2 y^2 = 6 \text{ find } \frac{dy}{dx}$$

$$\#22) \text{ Find } y'' \text{ given } x^4 - 2xy + y^4 = 16$$

$$\#23) \text{ If } x = y^3 - 7y^2 + 2 \text{ find } \frac{dy}{dx} \text{ at } (-4, 1)$$

Use a linear approximation (or differentials) to estimate the given number...

#24) $\sqrt{8.5}$

#25) $(2.001)^5$

#26) $e^{-0.015}$

Find the linearization $L(x)$ of the function at a ...

#27) $f(x) = x^{3/4}$ at $a = 16$

Solve...

#28) A conical tank has height 3 m and radius 2 m at the top. Water flows in at a rate of 2 cubic meters/minute. How fast is the water level rising when it is 2 m?

#29) A baseball diamond is a square with sides 90 ft. A batter hits the ball and runs toward first base with a speed of 30 ft/s.

- (a) At what rate is his distance from second base decreasing when he is halfway to first base?
- (b) At what rate is his distance from third base increasing at the same moment?

#30) The cost and revenue functions are $C(x) = x^2 + 2$, $R(x) = 2x^2 - x$ for the production and sale of x units (C and R are measured in thousands of dollars).

- (a) Find the marginal cost function.
- (b) Find the marginal revenue function.
- (c) Find the profit function.
- (d) Find the breakeven point. What happens when number of units is higher than the breakeven point?
- (e) Find and interpret the meaning of $C'(3)$.

#31) An particle moves along a line such that its position at time t is given by $s(t) = 2t^3 - 4t^2 + t$ where position is measured in m and t in seconds.

- (a) Find the velocity function.
- (b) Find the acceleration function.
- (c) At what time(s) is the velocity of the particle zero?
- (d) At what time(s) is the acceleration of the particle zero?
- (e) What is happening at the time(s) when the velocity of the particle is zero?