1 problem too long
Find left at 15
most 25-30

MATH 131
Quiz IV
October 16, 1987

Name KEY

med 15/20
$\bar{x}$ 13.56

1. Compute $\frac{dy}{dx}$, where $xy^2 + y^3 - x^2 = 5$.

$$x\,2y\frac{dy}{dx} + y^2 + 3y^2\frac{dy}{dx} - 2x = 0$$

$$(2xy + 3y^2)\frac{dy}{dx} = 2x - y^2$$

$$\frac{dy}{dx} = \frac{2x - y^2}{2xy + 3y^2}$$

$\frac{L}{2}$

2. Compute $f^{(3)}(x)$ for $f(x) = \tan x$.

$$f'(x) = \sec^2 x$$

$$f''(x) = 2\sec x \sec x \tan x = 2\sec^2 x \tan x$$

$$f'''(x) = 2\sec^2 x \sec^2 x + 2\tan x\, 2\sec x \sec x \tan x = 2\sec^4 x + 4\sec^2 x \tan^2 x$$

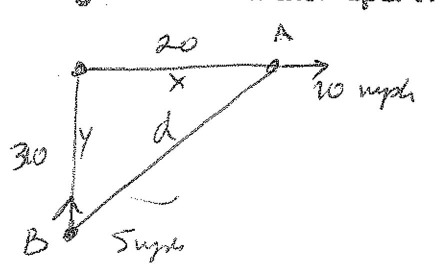
3. Suppose that xy = constant. If x is increasing at a rate of 2 ft/min, at what rate is y changing when $x = 2$ and $y = 5$.

$$x\frac{dy}{dt} + y\frac{dx}{dt} = 0 \qquad \frac{dx}{dt} = 2$$

$$2\frac{dy}{dt} + 5\cdot 2 = 0$$

$$\frac{dy}{dt} = -5 \text{ ft/min}$$

4. Boat A is 20 miles east of a lighthouse, and heading east at 10 mi/hr, while boat B is 30 miles south of the lighthouse heading north at 5 mi/hr. Are the boats getting closer together or farther apart?



$$d^2 = x^2 + y^2$$

$$2d\frac{dd}{dt} = 2x\frac{dx}{dt} + 2y\frac{dy}{dt}$$

$$2d\frac{dd}{dt} = 2(20)(10) + 2(30)(-5) = 400 - 300 = 100 > 0$$

when $x = 20$ $y = 10$

$\frac{dx}{dt} = 10$ $\frac{dy}{dt} = -5$

$d > 0$ so $\frac{dd}{dt} > 0$

5. Approximate $(.98)^{1/3}$ using tangent line approximation.

$$f(x) = x^{1/3} \qquad f'(x) = \frac{1}{3}x^{-2/3}$$

$$dy = f'(1)\,dx = \frac{1}{3}(-.02) = -\frac{.02}{3} = -.006\overline{7}$$

$$(.98)^{1/3} \approx 1^{1/3} - .006\overline{6} = .99\overline{3}$$

Newton $x_1 = 1$ $x^3 = .98$ $f'(x) = 3x^2$

$$x_2 = 1 - \frac{1 - .98}{3} = 1 - \frac{.02}{3} = 1 - .006\overline{6} = .9933\overline{3}$$