Name: Richard

QUIZ 7

MATH 200, SECTION 1

March 19, 2021

Directions: Closed book, closed notes, no calculators.

1. Find the following derivatives.

(a) $\frac{d}{dx}\left[\, x\ln(x)+\sin^{-1}(x)\,\right] =$ $1\cdot\ln(x)+x\frac{1}{x}+\frac{1}{\sqrt{1-x^2}}$

$= \boxed{\ln(x)+1+\frac{1}{\sqrt{1-x^2}}}$

(b) $\frac{d}{dx}\left[\,(\tan^{-1}(x))^3\,\right] =$ $3(\tan^{-1}(x))^2\frac{d}{dx}\left[\tan^{-1}(x)\right]$

$= \boxed{3(\tan^{-1}(x))^2\cdot\frac{1}{1+x^2}}$

(c) $\frac{d}{dx}\left[\,4\ln\left(3x^3+1\right)\right] =$ $4\frac{1}{3x^3+1}\frac{d}{dx}\left[3x^3+1\right] = 4\cdot\frac{1}{3x^2+1}\cdot 9x^2$

$= \boxed{\frac{36x^2}{3x^2+1}}$

2. An object moving on a straight line is $s(t)=2+t+t^3$ feet from its starting point at time t seconds. Find the object's velocity when its acceleration is 12 feet per second per second.

Velocity: $v(t)=s'(t)=1+3t^2$

Acceleration: $a(t)=v'(t)=6t$

To find when acceleration is $12\ ft/sec^2$, solve

$$a(t)=12$$
$$6t=12$$
$$t=2$$

Thus acceleration is $12\ ft/sec^2$ at time $t=2$ sec.

Velocity at this time is $v(2)=1+3\cdot 2^2=\boxed{13\ ft/sec}$