Quiz 20

November 16, 2016

Show all work and circle your final answer.

1. Find the antiderivative of the following:

   (a) $f(x) = x^2 - \frac{3}{2}x^4 + 18 + 2x^{-1}$

   $F(x) = \frac{x^3}{3} - \frac{3}{2}\frac{x^5}{5} + 18x + 2\ln|x| + C = \boxed{\frac{1}{3}x^3 - \frac{3}{10}x^5 + 18x + 2\ln|x| + C}$

   (b) $f(x) = \dfrac{x + 3x^2 - 1}{\sqrt{x}} = x^{1/2} + 3x^{3/2} - x^{-1/2}$

   $F(x) = \frac{x^{3/2}}{3/2} + 3\frac{x^{5/2}}{5/2} - \frac{x^{1/2}}{1/2} + C = \boxed{\frac{2}{3}x^{3/2} + \frac{6}{5}x^{5/2} - 2x^{1/2} + C}$

   (c) $f(x) = \dfrac{3}{\sqrt{1 - x^2}} = 3\left(\frac{1}{\sqrt{1-x^2}}\right)$

   $\boxed{F(x) = 3\arcsin x + C}$ (or $-3\arccos x + C$)

   (d) $f(x) = 20\sin x + 14\sec^2 x$

   $\boxed{F(x) = -20\cos x + 14\tan x + C}$

2. The velocity of a particle after t seconds is given by $v(t) = 8t^2 - 3$ and the position of the particle after 1 second is -10.

   (a) Find the position function $s(t)$.

   s(t) is the antiderivative of v(t):

   $s(t) = \frac{8}{3}t^3 - 3t + C$

   $s(1) = \frac{8}{3}(1)^3 - 3(1) + C \overset{\text{set}}{=} -10$

   $C = \frac{-29}{3}$

   So $\boxed{s(t) = \frac{8}{3}t^3 - 3t - \frac{29}{3}}$

   (b) Find the acceleration function $a(t)$.

   $a(t) = v'(t) = \boxed{16t}$