34 pts

A.P. Calculus AB Quiz 2-2, 2-3 Key A

Calculators are not permitted. Name ____ Date ____ Per. ____

Answers should not contain negative exponents.

1. Find $\frac{dy}{dx}$ if $y = -3x^2(x-4) - 30 + \frac{2}{x^3} + \sqrt[5]{x^4} + \frac{5}{\sqrt{x^7}}$ (7 points)

$y = -3x^3 + 12x^2 - 30 + 2x^{-3} + x^{4/5} + 5x^{-7/2}$

$y' = -9x^2 + 24x + 0 - 6x^{-4} + \frac{4}{5}x^{-1/5} + 5\left(-\frac{7}{2}\right)x^{-9/2}$

$$y' = -9x^2 + 24x - \frac{6}{x^4} + \frac{4}{5x^{1/5}} - \frac{35}{2x^{9/2}}$$

2. If $f(x) = \frac{x^2+4}{x^2-2}$, find $f'(x)$ (simplify fully). Then write the equation of the line tangent to $f(x)$ at $x = 1$ in point-slope form. (6 points)

$f'(x) = \frac{2x(x^2-2) - (x^2+4)(2x)}{(x^2-2)^2} = \frac{2x^3 - 4x - 2x^3 - 8x}{(x^2-2)^2} = \frac{-12x}{(x^2-2)^2} = f'(x)$

$* f'(1) = \frac{-12}{(1-2)^2} = -12$

$f(1) = \frac{1^2+4}{1^2-2} = \frac{5}{-1}$

$y + 5 = -12(x-1)$

Slope: $m = -12$

point: $(1, -5)$

3. Find the values of x on the graph of $h(x) = \frac{x-4}{x^2-7}$ where the tangent line is horizontal. (5 points)

$*$ set $f'(x) = 0$

$h'(x) = \frac{(1)(x^2-7) - (x-4)(2x)}{(x^2-7)^2}$

$= \frac{x^2 - 7 - 2x^2 + 8x}{(x^2-7)^2}$

$h'(x) = \frac{-x^2+8x-7}{(x^2-7)^2} = \frac{-(x^2-8x+7)}{(x^2-7)^2}$

$h'(x) = \frac{-1(x-7)(x-1)}{(x^2-7)^2}$

$x = 1, 7$

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4. Pierre is walking along a straight clothes line. His **position** can be modeled by the function $p(t) = 2t^3 - 21t^2 + 60t + 3$ where $p(t)$ is in feet, t is in hours and $t \geq 0$. Use this to answer the questions below. Include units with your answers for parts c, d. (2 points each part)

a. What is Pierre's velocity function?

$v(t) = 6t^2 - 42t + 60$

b. What is Pierre's acceleration function?

$a(t) = 12t - 42$

c. What is his velocity at $t = 1$?

$v(1) = 6(1)^2 - 42 + 60$

$v(1) = 24$ ft/hr

d. What is his acceleration at $t = 1$?

$a(1) = 12(1) - 42$

$= -30$ ft/hr^2

e. Is his velocity increasing or decreasing at $t = 1$? Why?

$v(1)$ is decreasing b/c

$a(1) < 0$

$a(1) = -30 < 0$

f. Is his speed increasing or decreasing at $t = 1$? Why?

speed is decreasing b/c $v(1)$ and $a(1)$ have opposite signs

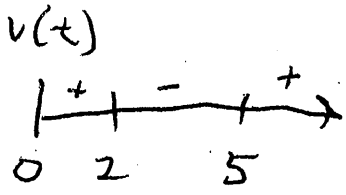
g. When did Pierre stop?

$v(t) = 6t^2 - 42t + 60$

$0 = 6(t^2 - 7t + 10)$

$6(t-5)(t-2)$

$t = 2, 5$ hr.



h. On what intervals is he moving to the left and right?

Moving left on $(2, 5)$

Moving right on $[0, 2) \cup (5, \infty)$

A.P. Calculus AB **Quiz 2-2, 2-3**
Calculators are not permitted.
Answers should not contain negative exponents.

Key B

Name _____ Date _____ Per. _____

1. Find $\frac{dy}{dx}$ if $y = -5x(x^2 - 4) - 40.86 + \frac{2}{x^4} - \sqrt[5]{x^2} + \frac{3}{\sqrt{x^3}}$ (7 points)

$y = -5x^3 + 20x - 40.86 + 2x^{-4} - x^{2/5} + 3x^{-3/2}$

$y' = -15x^2 + 20 - 0 - 8x^{-5} - \frac{2}{5}x^{-3/5} - \frac{9}{2}x^{-5/2}$

$$y' = -15x^2 - \frac{8}{x^5} - \frac{2}{5x^{3/5}} - \frac{9}{2x^{5/2}} + 20$$

2. If $f(x) = \frac{x^2+2}{x^2-2}$, find $f'(x)$ (simplify fully). Then write the equation of the line tangent to $f(x)$ at $x = 1$. (6 points)

$f'(x) = \frac{2x(x^2-2) - (x^2+2)(2x)}{(x^2-2)^2} = \frac{2x^3 - 4x - 2x^3 - 4x}{(x^2-2)^2} = \boxed{\frac{-8x}{(x^2-2)^2}}$

$f'(1) = \frac{-8}{(1-2)^2} = -8$

$f(1) = \frac{1+2}{1-2} = \frac{3}{-1} = -3$

point: $(1, -3)$

slope: $m = -8$

$$y + 3 = -8(x - 1)$$

3. Find the values of x on the graph of $h(x) = \frac{x-3}{x^2-5}$ where the tangent line is horizontal. (5 points)

set $h'(x) = 0$

$h'(x) = \frac{(1)(x^2-5) - (x-3)(2x)}{(x^2-5)^2}$

$h'(x) = \frac{x^2 - 5 - 2x^2 + 6x}{(x^2-5)^2}$

$h'(x) = \frac{-x^2 + 6x - 5}{(x^2-5)^2}$

$h'(x) = \frac{-(x^2-6x+5)}{(x^2-5)^2} = \frac{-(x-5)(x-1)}{(x^2-5)^2}$

$0 = -(x-5)(x-1)$

$\boxed{x = 5, 1}$

4. Pierre is walking along a straight clothes line. His **position** can be modeled by the function $p(t) = 2t^3 - 18t^2 + 48t + 3$ where $p(t)$ is in feet, t is in hours and $t \geq 0$. Use this to answer the questions below. Include units with your answers for parts c, d. (2 points each part)

a. What is Pierre's velocity function?

$v(t) = 6t^2 - 36t + 48$

b. What is Pierre's acceleration function?

$a(t) = 12t - 36$

c. What is his velocity at $t = 1$?

$v(1) = 6(1)^2 - 36(1) + 48$

$v(1) = 18$ ft/hr.

d. What is his acceleration at $t = 1$?

$a(1) = 12(1) - 36$

$= -24$ ft/hr^2

e. Is his velocity increasing or decreasing at $t = 1$? Why?

Decreasing. Since $a(1) < 0$, velocity is decreasing.

f. Is his speed increasing or decreasing at $t = 1$? Why?

Speed is decreasing b/c $a(t)$ and $v(t)$ have opposite signs

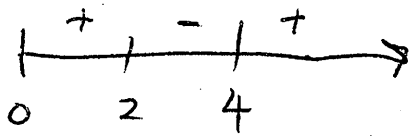
g. When did Pierre stop?

$0 = 6t^2 - 36t + 48$

$0 = 6(t^2 - 6t + 8)$

$0 = 6(t-4)(t-2)$

$t = 2, 4$ hr.



h. On what intervals is he moving to the left and right?

Moving left on $(2, 4)$

Moving right on $[0, 2) \cup (4, \infty)$