Review for Exam 1 quarter 2

1. a) $s(3) = 21$
b) $v(t) = 3t^2 - 18t + 24$
$v(3) = -3$
c) $a(t) = 6t - 18$
$a(3) = 0$
d) Neither, moving at a constant speed
e) $v(t) = 0$
$3t^2 - 18t + 24 = 0$
$3(t^2 - 6t + 8) = 0$
$(t-4)(t-2) = 0$
$t = 4 \mid t = 2$
f) $v(t)$: + (0, 2), − (2, 4), + (4, ∞)
Right $[0,2) \cup (4,\infty)$
g) $|s(2) - s(0)| + |s(4) - s(2)|$
24

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2) a) $s(3) = 6$
b) $v(3) = 7$
c) $a(3) = 10$
d) Speeding up b/c $v(t)$ & $a(t)$ have the same signs (both +)
e) $v(t) = 0$
$v(t) = 3t^2 - 8t + 4$
$0 = (3t^2 - 6t)(2t + 4)$ Mult: 12, add: −8
$0 = 3t(t-2) - 2(t-2)$ −6, −2
$= (3t-2)(t-2)$
$= t = 2/3, 2$
$v(t)$: + (0, 2/3), − (2/3, 2), + (2, ∞)
left $(2/3, 2)$
g) $|s(2/3) - s(0)| + |s(2) - s(2/3)| + |s(4) - s(2)|$
$\frac{496}{27}$

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3a) $x^2 - y^2 = 2xy$

$2x - 2y\,dy/dx = 2x\,dy/dx + 2y$

$2x - 2y = 2x\,dy/dx + 2y\,dy/dx$

$\frac{2x - 2y}{2x + 2y} = \frac{dy/dx\,(2x + 2y)}{2x + 2y}$

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b) $x^3 + xy + y^3 = 4$

$3x^2 + x\,dy/dx + y + 3y^2\,dy/dx = 0$

$x\,dy/dx + 3y^2\,dy/dx = -3x^2 - y$

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

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c) $\frac{1}{y} + \frac{1}{x} = 2$

$y^{-1} + x^{-1} = 2$

$-y^{-2}\,dy/dx - x^{-2} = 0$

$\frac{-y^{-2}\,dy/dx}{-y^{-2}} = \frac{x^{-2}}{-y^{-2}}$

$dy/dx = \frac{-y^2}{x^2}$

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d) $3x^4 = (2xy - 1)^3$

$\frac{12x^3}{3(2xy-1)^2} = \frac{3(2xy-1)^2(2x\,dy/dx + 2y)}{3(2xy-1)^2}$

$\frac{12x^3}{3(2xy-1)^2} = 2x\,dy/dx + 2y$

$\frac{1}{2x}\left(\frac{12x^3}{3(2xy-1)^2} - \frac{2y}{1}\right) = 2x\,dy/dx \cdot \frac{1}{2x}$

$\frac{1}{2x}\left(\frac{12x^3}{3(2xy-1)^2} - \frac{2y(3(2xy-1)^2)}{3(2xy-1)^2}\right) = dy/dx$

$\frac{12x^3 - 2y(3(2xy-1)^2)}{2x(3(2xy-1)^2)} = dy/dx$

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4a) $y^2 = \frac{x^2-4}{x^2+4}$ @ (2,0)

1. $2y\,dy/dx = \frac{(x^2+4)(2x)-(x^2-4)(2x)}{(x^2+4)^2} \cdot \frac{1}{2y}$

$= \frac{(2^2+4)(2(2))-(2^2-4)(2(2))}{(2^2+4)^2 \cdot 2(0)}$

$= \frac{32-0}{0} \rightarrow 32/0$ undef.

$x=2$

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b. $(x+y)^3 = x^3+y^3$ at $(-1,1)$

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

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

$3(x+y)^2(1+dy/dx) = 3x^2+3y^2\,dy/dx$

$3(-1+1)^2(1+dy/dx) = 3(-1)^2+3(1)^2\,dy/dx$

$3(0)^2(1+dy/dx) = 3+3\,dy/dx$

$0 = 3+3\,dy/dx$

$\frac{-3}{3} = \frac{3\,dy/dx}{3}$

$-1 = dy/dx$

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5.

$S(t) = \sec t + 2t$

find $V(\pi)$

$V(t) = \sec t \tan t + 2$

$V(\pi) = \sec\pi \tan\pi + 2$

$= \frac{1}{\cos\pi} \cdot \frac{\sin\pi}{\cos\pi} + 2$

$= -1\left(\frac{0}{-1}\right)+2$

$= 0+2$

$= 2$

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6 a) $x^2+y^2=9$ $\frac{d^2y}{dx^2}$

$2x+2y\,dy/dx = 0$

$\frac{2y\,dy/dx}{2y} = \frac{-2x}{2y}$

$dy/dx = \frac{-x}{y}$

$\frac{y(-1)-(-x)\frac{dy}{dx}}{y^2}$

$\frac{-y+x\left(\frac{-x}{y}\right)}{y^2}$

$\frac{y\left(\frac{-y}{1}\right)-\left(\frac{x^2}{y}\right)y}{\left(\frac{y^2}{1}\right)y}$

$\frac{-y^2-x^2}{y^3} \rightarrow \frac{-(y^2+x^2)}{y^3} \rightarrow \frac{-9}{y^3}$

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b. $x^3-y^3=4$ $\frac{d^2y}{dx^2}$

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

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

$dy/dx = \frac{x^2}{y^2}$

$\frac{y^2(2x)-x^2(2y\,dy/dx)}{y^4}$

$\frac{2xy^2-x^2 2y\left(\frac{x^2}{y^2}\right)}{y^4}$

$\frac{y^2\left(\frac{2xy^2}{1}\right)-\left(\frac{2x^4y}{y^2}\right)y^2}{\left(\frac{y^4}{1}\right)y^2}$

$\frac{2xy^4-2x^4y}{y^4 \cdot 4}$

$\frac{2xy(y^3-x^3)}{y^6} \rightarrow \frac{-8xy}{y^6}$

$-\frac{8x}{y^5}$

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