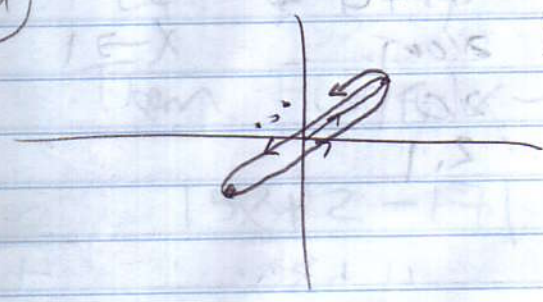
Practice Exam 1 10.01

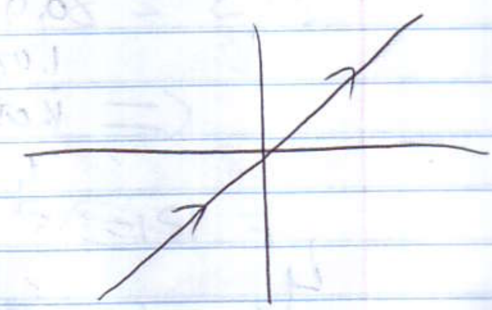
$x = \sin(2t) = 2\sin t\cos t = y$

1.

(a)



(b)



$x = y$

(a) has $-1 \le x, y \le 1$
repeats back + forth

(b) has $x, y \in \mathbb{R}$
only passes once

2. (a) (i) 5.4 ft³/sec
(ii) 1.397 ft³/sec
(iii) 0.9477 ft³/sec
(iv) 0.5 ft³/sec
(v) 0.6669 ft³/sec

(b) 2/3 ft³/sec

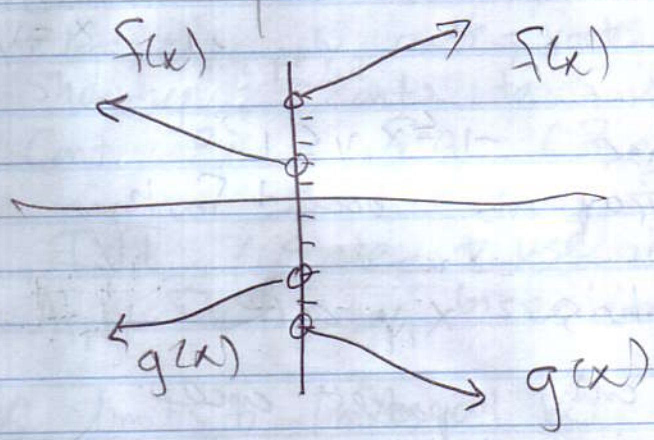
3

3.

x	$\frac{x^2-1}{x-1}$
0.9	1.9
0.99	1.99
0.999	1.999
1.001	2.001
1.01	2.01
1.1	2.1

$$\lim_{x \to 1} \frac{x^2-1}{x-1} \approx 2$$

4.



5.

$$\lim_{x \to -3^+} \frac{x+3}{|x+3|} = \lim_{x \to -3^+} \frac{x+3}{x+3} = 1$$

$$\lim_{x \to -3^-} \frac{x+3}{|x+3|} = \lim_{x \to -3^-} -\left(\frac{x+3}{x+3}\right) = -1 \ \#$$

So $\lim_{x \to -3} \frac{x+3}{|x+3|}$ DNE

$\lim_{x \to a} f(x) = L$

6. $\forall \; \varepsilon > 0 \; \exists \; \delta > 0 \; \ni$

$0 < |x - a| < \delta \Rightarrow |f(x) - L| < \varepsilon$

Let $\varepsilon > 0$, set $\delta = \varepsilon/5$

Then $0 < |x - 3| < \delta \Rightarrow$

$|5x + 2 - 17| = |5x - 15| =$

$5|x - 3|$

$< 5\delta = 5\varepsilon/5 = \varepsilon$

7 $\lim_{x \to 0} \frac{\sqrt{x+1} - 1}{x} \cdot \frac{\sqrt{x+1} + 1}{\sqrt{x+1} + 1}$

$= \lim_{x \to 0} \frac{x + 1 - 1}{x(\sqrt{x+1} + 1)}$

$= \lim_{x \to 0} \frac{\cancel{x}}{\cancel{x}(\sqrt{x+1} + 1)} = \lim_{x \to 0} \frac{1}{\sqrt{x+1} + 1} = \frac{1}{1}$

$= 1$

8. $p(x) = x^3 + 2x^2 + 3x + 4$ is a polynomial, hence cont's, hence IVT applies

$p(-2) = -2$
$p(-1) = 2$

$-2 < 0 < 2 \Rightarrow \exists$
$c \in (-2, -1) \ni p(c) = 0$

9. Cont$^{\epsilon}$ at $x = 5$

$$\lim_{x \to 5} r(x) = r(5) = 100$$

10. $$\lim_{x \to \infty} \frac{3x^5 - 5x^3}{4x^5 + 3x^4} \cdot \frac{1/x^5}{1/x^5}$$

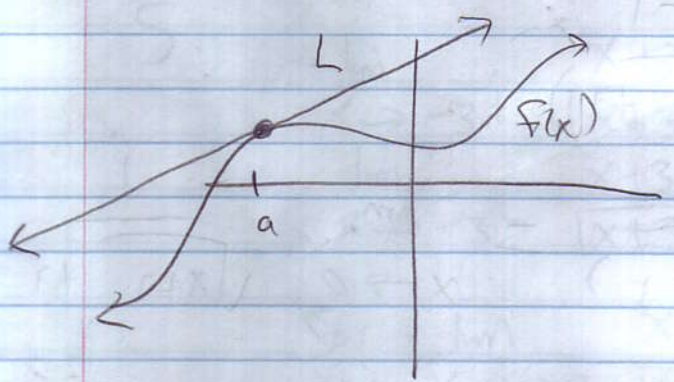
$$= \lim_{x \to \infty} \frac{3 - 5/x^2}{4 + 3/x} = \frac{3}{4}$$

10:13

Tangents & Instantaneous Rates of change

$\boxed{2.6}$

Recall:



L is tangent to f(x) at a

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