HOMEWORK 4 - ANSWERS TO (MOST) PROBLEMS

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1. Section 2.6: Limits at Infinity; Horizontal Asymptotes

2.6.4.

(a) 2
(b) -2
(c) ∞
(d) $-\infty$
(e) $-\infty$
(f) Horizontal asymptotes: $y = -2$, $y = 2$; Vertical asymptotes: $x = -2$, $x = 0$, $x = 3$

2.6.22. $\frac{1}{3}$ (factor out x from the numerator and pull out the x^2 from inside the square root)

2.6.32. $-\infty$ (factor out x^3 from the numerator and x^2 from the denominator)

2.6.34. $\tan^{-1}(-\infty) = -\frac{\pi}{2}$ (by continuity of $\tan^{-1}$)

2.6.57. 5 (by the squeeze theorem)

2. Section 2.7: Derivatives and Rates of Change

2.7.6. $y = x + 4$ ($(y - 3) = (x + 1)$ is also acceptable)

2.7.12.

(a) A runs with constant speed, while B is slow at first and then speeds up
(b) ≈ 8.5 seconds
(c) 9 seconds

2.7.17. $g'(0) < 0 < g'(4) < g'(2) < g'(-2)$

2.7.18.

(a) $y = 4x - 23$ ($y + 3 = 4(x - 5)$ is also acceptable)
(b) $f(4) = 3$, $f'(4) = \frac{1}{4}$

2.7.32. $f(x) = \sqrt[4]{x}$, $a = 16$

2.7.34. $f(x) = \tan(x)$, $a = \frac{\pi}{4}$

2.7.40. $\approx -\frac{5}{6}$ F/min (slope of the red line)

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2.7.46.

(a) Rate of bacterias/hour after 5 houts
(b) $f'(10) > f'(5)$ (basically, the more bacteria there are, the more can be produced). But if there's a limited supply of food, we get that $f'(10) < f'(5)$, i.e. bacterias are dying out because of the limited supply

3. Section 2.8: The derivative as a function

2.8.3.

(a) II
(b) IV
(c) I
(d) III

2.8.21. $f'(t) = 5 - 18t$

2.8.38. -1 (not continuous there); 2 (graph has a kink)

2.8.43.

(a) Acceleration
(b) Velocity
(c) Position

2.8.52. Not differentiable at the integers, because not continuous there; $f'(x) = 0$ for x not an integer, undefined otherwise. Graph looks like the 0-function, except it has holes at the integers.