

MAT122 Homework 5: Solutions

2.5.7. $f'(x) > 0, f''(x) > 0$

2.5.8. $f'(x) = 0, f''(x) = 0$

2.5.9. $f'(x) < 0, f''(x) = 0$

2.5.10. $f'(x) < 0, f''(x) > 0$

2.5.11. $f'(x) > 0, f''(x) < 0$

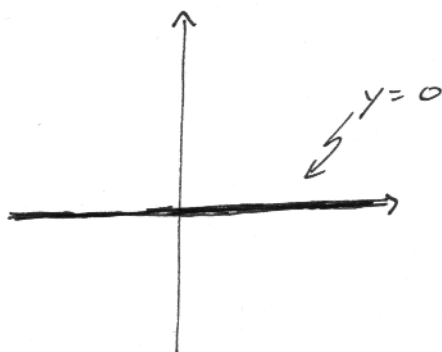
2.5.12. $f'(x) < 0, f''(x) < 0$

2.5.13.

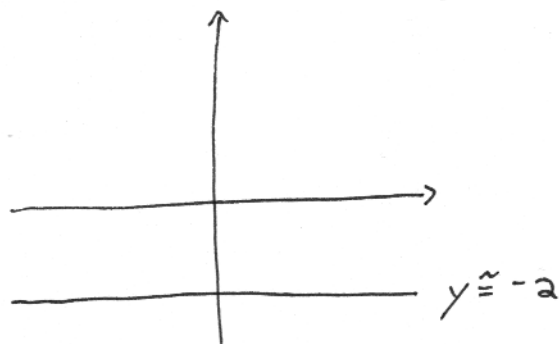
$$v(t) = \lim_{r \rightarrow t} \frac{(5t^2 + 3) - (5r^2 + 3)}{t - r} = \lim_{r \rightarrow t} \frac{5t^2 - 5r^2}{t - r} = \lim_{r \rightarrow t} \frac{5(t + r)(t - r)}{t - r} = \lim_{r \rightarrow t} 5(t + r) = 10t$$

$$a(t) = \lim_{r \rightarrow t} \frac{(10t) - (10r)}{t - r} = \lim_{r \rightarrow t} \frac{10(t - r)}{t - r} = \lim_{r \rightarrow t} 10 = 10$$

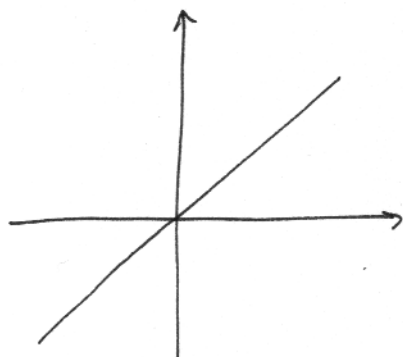
16.



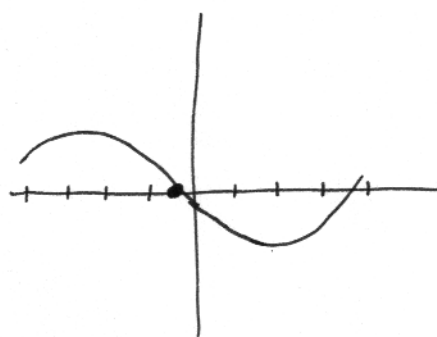
17.



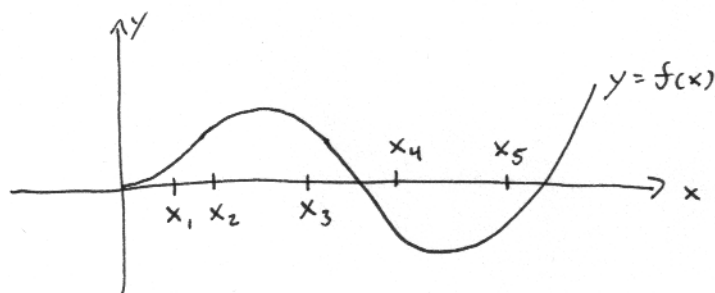
18.



19.



27.



- | | |
|---|--------------------|
| (a) show $f(x) < 0$ | at x_4, x_5 |
| (b) $f'(x) < 0$ | at x_3, x_4 |
| (c) $f(x)$ decreasing | at x_3, x_4 |
| (d) $f'(x)$ decreasing | at x_2, x_3 |
| (e) slope of f positive | at x_1, x_2, x_5 |
| (f) slope of f negative increasing | at x_1, x_4, x_5 |

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Find the derivatives. Assume a,b,c, and k are constants.

3.1.7. $y = x^{12}$
 $y' = 12x^{12-1} = 12x^{11}$

3.1.11. $y = x^{4/3}$
 $y' = \frac{4}{3}x^{4/3-1} = \frac{4}{3}x^{1/3}$

3.1.13. $y = x^{-3/4}$
 $y' = -\frac{3}{4}x^{-3/4-1} = -\frac{3}{4}x^{-7/4}$

3.1.17. $y = \frac{1}{r^{7/2}} = r^{-7/2}$
 $y' = -\frac{7}{2}r^{-7/2-1} = -\frac{7}{2}r^{-9/2}$

3.1.21. $f(x) = \sqrt{\frac{1}{x^3}} = \frac{\sqrt{1}}{\sqrt{x^3}} = \frac{1}{(x^3)^{1/2}} = \frac{1}{x^{3/2}} = x^{-3/2}$
 $f'(x) = -\frac{3}{2}x^{-5/2}$

3.1.27. $f(x) = 5x^4 + \frac{1}{x^2} = 5x^4 + x^{-2}$
 $f'(x) = 5 \cdot 4x^3 + (-2)x^{-3} = 20x^3 - 2x^{-3}$

3.1.33. $y = t^{3/2}(2 + \sqrt{t}) = t^{3/2}(2 + t^{1/2}) = 2t^{3/2} + t^{4/2} = 2t^{3/2} + t^2$
 $y' = 2 \cdot \frac{3}{2}t^{1/2} + 2t^1 = 3t^{1/2} + 2t$

3.1.41. $f(x) = \frac{ax+b}{x} = \frac{ax}{x} + \frac{b}{x} = a + bx^{-1}$
 $f'(x) = 0 + b \cdot (-1)x^{-2} = -bx^{-2}$