Math 1650 Homework Solutions
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§ 2.3

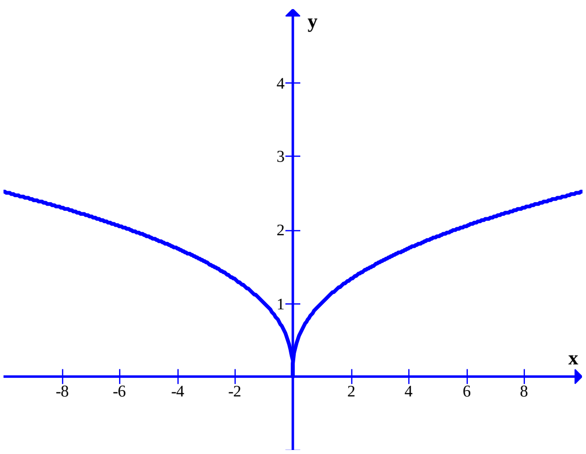
6 – 12 (even), 18 – 30 (even)

5 – 12 A function *f* is given.

(a) Use a graphing device to draw the graph of *f*.

(b) State approximately the intervals on which *f* is increasing and on which *f* is decreasing.

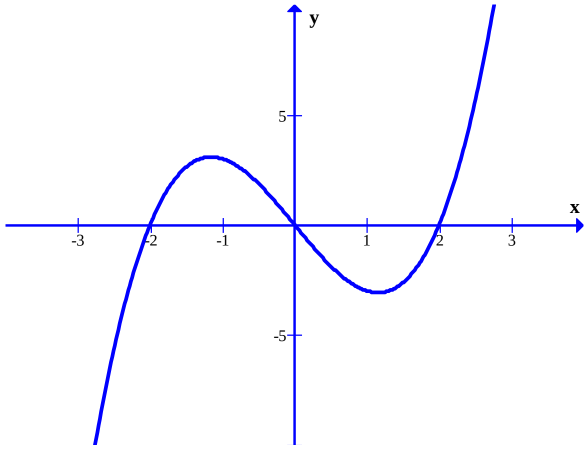
6) $f(x) = x^{2/5}$



f is increasing on the interval $(0,\infty)$

f is decreasing on the interval $(-\infty,0)$

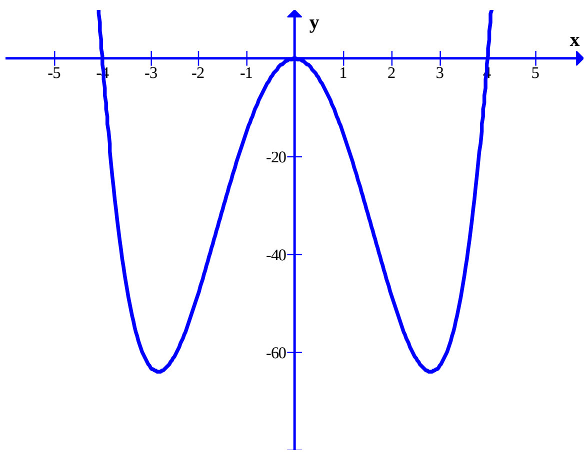
8) $f(x) = x^3 - 4x$



f is increasing on the intervals (-infty,-1) and (1,∞)

f is decreasing on the interval (-1,1)

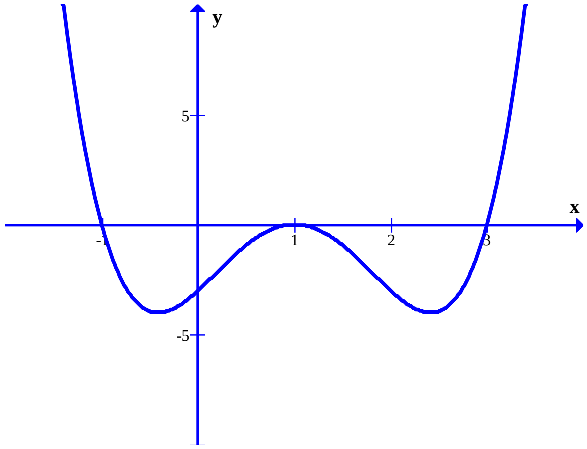
10) $f(x) = x^4 - 16x^2$



f is increasing on the intervals (-3,0) and (3,∞)

f is decreasing on the interval (-∞,-3) and (0,3)

12) $f(x) = x^4 - 4x^3 + 2x^2 + 4x - 3$



f is increasing on the intervals (-0.5,0) and (2.5,∞)

f is decreasing on the intervals (-∞,-0.5) and (1,2.5)

17 – 28 A function is given. Determine the average rate of change of the function between the given values of the variables.

18) $f(x) = 3x - 2 \quad x = 2, x = 3$

$$\text{average rate of change} = \frac{f(3) - f(2)}{3 - 2} = \frac{7 - 4}{1} = 3$$

20) $f(z) = 1 - 3z^2 \quad z = -2, z = 0$

$$\text{average rate of change} = \frac{f(0) - f(-2)}{0 - (-2)} = \frac{1 - (-11)}{2} = \frac{12}{2} = 6$$

22) $f(x) = x + x^4 \quad x = -1, x = 3$

$$\text{average rate of change} = \frac{f(3) - f(-1)}{3 - (-1)} = \frac{84 - 0}{4} = \frac{84}{4} = 21$$

24) $f(x) = 4 - x^2 \quad x = 1, x = 1 + h$

$$\text{average rate of change} = \frac{f(1 + h) - f(1)}{(1 + h) - 1} = \frac{4 - (1 + h)^2 - 3}{h}$$

$$= \frac{1 - (1 + 2h + h^2)}{h} = \frac{-2h - h^2}{h} = -2 - h$$

26) $g(x) = \frac{2}{x+1} \quad x = 0, x = h$

$$\text{average rate of change} = \frac{f(h) - f(0)}{h - 0} = \frac{\frac{2}{h+1} - 2}{h} = \frac{\frac{2}{h+1} - \frac{2(h+1)}{h+1}}{h}$$

$$= \frac{\frac{2 - 2h - 2}{h+1}}{h} = \frac{-2}{h+1}$$

28) $f(t) = \sqrt{t} \quad t = a, t = a + h$

$$\text{average rate of change} = \frac{f(a+h) - f(a)}{a + h - a} = \frac{\sqrt{a+h} - \sqrt{a}}{h}$$

$$= \left(\frac{\sqrt{a+h} - \sqrt{a}}{h}\right)\left(\frac{\sqrt{a+h} + \sqrt{a}}{\sqrt{a+h} + \sqrt{a}}\right) = \frac{(a+h) - a}{h(\sqrt{a+h} + \sqrt{a})}$$

$$= \frac{1}{\sqrt{a+h} + \sqrt{a}}$$

29 – 30 A linear function is given.

(a) Find the average rate of change of the function between x = a and x = a+h.

(b) Show that the average rate of change is the same as the slope of the line.

30) $g(x) = -4x + 2$

$$\text{average rate of change} = \frac{f(a+h) - f(a)}{a + h - a} = \frac{-4(a+h) + 2 - (-4a + 2)}{h}$$

$$= \frac{-4a - 4h + 2 + 4a - 2}{h} = -4$$

The average rate of change is -4 and the slope of the line is also -4.