

READ AND FOLLOW ALL DIRECTIONS. CIRCLE YOUR FINAL ANSWERS.
SHOW ALL WORK TO RECEIVE FULL CREDIT. NO CALCULATORS.

1. (4 points) Identify whether or not each of the following functions is a polynomial. If the function is a polynomial, give its degree; if not, state your reason.

(a) $f(x) = 54$ Yes. Degree 0 since $f(x) = 54 = 54x^0$

(b) $g(x) = (x^2 + 5)(x^3 + 6x + 2)$
Yes. Degree 5.

(c) $s(x) = x^{\frac{1}{2}} + x^3 + x$
No. A polynomial may not have a fractional power of x .

(d) $R(x) = \frac{1}{x^2 + 2x + 3}$
No. This is a rational function which is proper.

2. (2 points) Circle the correct option:

The graph of $f(x) = x^n$, for n even, is symmetric about the (origin/x-axis/neither).

The graph of $f(x) = x^n$, for n odd, is symmetric about the (origin/y-axis/neither).

3. (2 points each) Identify the domain of each of the following functions:

(a) $f(x) = x(x + 2)(x + 3)$

$\text{dom } f = \{x \mid x \text{ is a real number}\}$ since f is a polynomial

(b) $R(x) = \frac{x^2 + 4x + 3}{x^2 - 1}$

$= \frac{(x+3)(x+1)}{(x+1)(x-1)}$

$\text{dom } R = \{x \mid x \neq 1, x \neq -1\}$

Quiz #6

4. (10 points) Let $f(x) = x(x^2 + 2x + 1)$

(a) Identify the x-intercepts of the graph of f .

$$f(x) = x(x^2 + 2x + 1) = x(x+1)^2$$

x-intercepts occur where $f(x) = 0 = x(x+1)^2$

So $x = 0$ and $x = -1$ are the x-intercepts

(b) Identify the y-intercepts of the graph of f .

$$y\text{-intercept is at } f(0) = 0(0^2 + 2 \cdot 0 + 1) = 0$$

$$y = 0$$

(c) Determine whether the graph crosses or touches the x-axis at each x-intercept. (e.g. "The graph of (crosses/touches) the x-axis at $x=c$.")

$x = 0$ is of multiplicity 1, so

The graph of f crosses the x-axis at $x = 0$.

$x = -1$ is of multiplicity 2, so the graph of f touches the x-axis at $x = -1$.

(d) Identify the power function that the graph of f resembles for large values of $|x|$.

$$y = x^3$$

5. (2 points) EXTRA CREDIT. What is the minimum degree of a polynomial whose graph has 4 turning points?

The minimum degree of such a polynomial is $4 + 1 = 5$