

Model Mid-Term Exam Paper

1. Factor completely.

a) $x^2 - 8x + 12$

b) $27y + 10y^2 + 5$

c) $10x^3 + 105x^2y - 55xy^2$

d) $4x^2 - 28x + 49$

e) $81c^4 + 90c^2d + 25d^2$

f) $34y^4 - 162$

2. Perform the indicated operation and simplify.

a) $\frac{x^2 - 16}{x^2 - x - 12}$

b) $\frac{2xy}{x^2y + 3xy} \cdot \frac{x^2 + 6x + 9}{4x + 12}$

c) $\frac{x^2 - 4}{x} \div \frac{3x^3 - 12x}{5x^3}$

d) $\frac{3 - x}{2x + 1} + \frac{x}{x - 1}$

e) $\frac{1}{x^2} - \frac{2}{x + 1}$

3. Solve the equation.

a) $-3(x - 4) + 5 = 10 - (x + 1)$

b) $\frac{x - 2}{5} - \frac{x - 4}{2} = \frac{x + 5}{15} + 2$

c) $\frac{x}{x - 4} = \frac{4}{x - 4} - \frac{4}{5}$

d) $\frac{6}{y^2 + 8y + 15} - \frac{2}{y + 3} = \frac{-4}{y + 5}$

e) $x^2 - 8x = 0$
 f) $2x(2x - 7) = -12$
 g) $x^2 - 3 = -10x$
 h) $-2x^2 - 3x - 5 = 0$
 i) $x(x - 6) = 3$
 j) $x^2 - 4x - 1 = 0$
 k) $4x^2 - 4x + 1 = 0$
 l) $\frac{3}{10}x^2 - \frac{2}{5}x + \frac{7}{10} = 0$
 m) $4x^3 + 12x^2 - 9x - 27 = 0$
 n) $\frac{2x}{x-4} - \frac{3}{x+2} = \frac{x^2+14}{x^2-2x-8}$
 o) $2|3-2x| = 6$
 p) $2 = |7w-3| + 8$
 q) $|2x-5| = |x+1|$
 r) $\sqrt{x-1} - \sqrt{3x+1} = -2$

4. Perform the indicated operation and write each expression in standard form.

a) $\sqrt{-9} \cdot \sqrt{-25}$ b) $\sqrt{-15} \cdot \sqrt{-3}$ c) $\frac{\sqrt{-50}}{\sqrt{-2}}$
 d) i^{48} e) i^{23} f) i^{-19}
 g) $-\frac{1}{2}i(4+6i)$ h) $(-2+6i)(4-3i)$
 i) $\frac{8+2i}{3-5i}$ j) $\frac{1}{2+\sqrt{3}i}$ k) $\frac{-2}{5i}$

5. Solve the inequality. Graph the solution set and write the solution set in set builder notation and in interval notation.

$$\text{a) } \frac{x+1}{3} - \frac{2x-4}{6} \leq -\frac{x}{2}$$

$$\text{b) } x-2 \leq 5 \text{ or } \frac{1}{2}x > 6$$

$$\text{c) } 5 < -2x+7 \leq 11$$

$$\text{d) } -4 \leq -2|3x+1|$$

$$\text{e) } 2|6-x|-3 < 7$$

6. Determine if the points $M(-2, -3)$, $P(4, 1)$ and $Q(-1, 7)$ form the vertices of a right triangle.

7. Write the domain of each function in interval notation.

$$\text{a) } f(x) = \frac{x+3}{2x-5}$$

$$\text{b) } g(x) = \frac{x}{x^2+4}$$

$$\text{c) } h(t) = \sqrt{2-t}$$

$$\text{d) } m(a) = |4+a|$$

8. Write the equation of the circle in standard form. Then identify the center and radius.

$$x^2 + y^2 + 10x - 6y + 25 = 0$$

9. Write an equation of the line that passes through the point $(2, -3)$ and has slope -4 . Then write the linear equation using function notation, where $y = f(x)$.

10. Find the equation of the line that passes through the points $(4, -6)$ and $(-1, 2)$.

Write the answer in slope-intercept form.

11. Find the equation of the line that passes through the point $(-4, 1)$ and is parallel to the line $x + 4y = 3$. Write the answer in slope-intercept form and in standard form.

12. Find the equation of the line that passes through the point $(2, -3)$ and is perpendicular to the line $y = \frac{1}{2}x - 4$. Write the answer in slope-intercept form and

in standard form.

13. Use transformations to graph the function defined by

$$f(x) = -\frac{1}{2}(x-2)^2 + 3$$

14. Use transformations to graph the function defined by

$$g(x) = -\sqrt{-x+2}$$

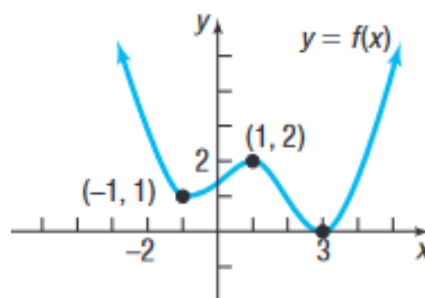
15. Determine if the following is even, odd or neither.

(a) $f(x) = -2x^4 + 5|x|$ (b) $g(x) = 4x^3 - x$ (c) $h(x) = 2x^2 + x$

16. Graph the function defined by

$$f(x) = \begin{cases} x+3 & \text{if } x < -1 \\ x^2 & \text{if } -1 \leq x < 2 \end{cases}$$

17. For the graph of $y = f(x)$.



- Determine the location and value of any relative maximum.
- Determine the location and value of any relative minimum.
- Use interval notation to write the interval(s) over which f is increasing, decreasing or constant.

18. Given $f(x) = -2x^2 + 4x - 1$,

a) Find $f(x + h)$.

b) Find the difference quotient, $\frac{f(x+h) - f(x)}{h}$.

19. Given $f(x) = x^2 + 2x$ and $g(x) = x - 4$, find

(a) $f(g(6))$ (b) $g(f(-3))$ (c) $(f \circ g)(0)$ (d) $(g \circ f)(5)$

20. Given $f(x) = \frac{1}{x-5}$ and $g(x) = \sqrt{x-2}$, find $(f \circ g)(x)$ and write the domain in interval notation.

21. Given $f(x) = \frac{x}{x-2}$ and $g(x) = \frac{6}{x^2-1}$, find $(f \circ g)(x)$ and write the domain in interval notation.

22. Given $h(x) = |2x^2 - 5|$, find two functions f and g such that $h = (f \circ g)(x)$.