

Name: _____ PID: _____

TA: _____ Sec. No: _____ Sec. Time: _____

Math 3C
Practice Final
Winter, 2011

I expect you can solve any problem given on the first two midterms, so consider those exams as part of this review.

updated March 11, 2011

1. (a) Find an equation of the line through the points $P = (1, 2)$ and $Q = (-3, -4)$.

(b) What is the slope of the line found in (a)?

(c) Find an equation of the line perpendicular to the line found in (a) which goes through the origin.

(d) Find the center and radius of the circle given by the equation $x^2 + 4x + y^2 - 2y = 1$.

2. Let $f(x) = x^2$, $g(x) = x + 10$ and $h(x) = 1/(2x)$. Find

(a) $f(x)/h(x)$

(b) $g(h(x))$

(c) $g(f(2))$

3. Consider the function

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

(a) State the domain of f and sketch the graph of f .

(b) Find the inverse function $f^{-1}(x)$.

(c) State the domain of f^{-1} and sketch the graph of f^{-1} .

4. Identify whether the following functions are odd, even or neither:

(a) $\cos(x)$

(b) $x^2 + 3x + 5$

(c) $x^3 + \tan(x)$

5. (a) Write an equation for the graph of function $y = x^2$ translated 3 units to the right, stretched (with respect to the y -axis) by a factor of two, translated 3 units down then reflected over the x -axis.

(b) Find the x -intercepts, y -intercept and vertex of the graph of $f(x) = x^2 - 5x + 4$.

(c) Sketch the graph of $f(x) = x^2 - 5x + 4$.

6. Consider the quartic function $f(x) = x^4 + 2x^3 + x^2$

(a) State the degree of f

(b) State the total number of real and/or complex zeros of f counting multiplicity.

(c) Factor f completely.

7. (a) Solve the following inequality and write the solution in interval notation

$$\frac{2x - 1}{x + 3} \geq x - 3$$

(b) Sketch the graph of the solution you found in (a).

8. Solve the following equations and check your answers.

(a) $|x| = x^2 - x$

(b) $\sqrt{x+3} = 1 + \sqrt{x-2}$

(c) $\sqrt{8-6x} = x-4$

9. State the domain, range, phase-shift and period and sketch one cycle of the following functions:

(a) $\sin[2(x + \pi/2)] + 1$

(b) $\tan(2x)$

(c) $\cos(x - \pi/3)$

10. Find:

(a) $\csc(-\pi/3)$

(b) $\sec(5\pi/4)$

(c) $\tan^{-1}(-1)$

(d) $\sin^{-1}(1/2)$.

11. Find all real solutions:

(a) $\sin(2x) = 1/\sqrt{2}$.

(b) $\cos(3x) = 1/2$.

12. Let $\cos(\alpha) = 1/3$ and $0 < \alpha < \pi/2$. Let $\sin(\beta) = 1/5$ and $\pi/2 < \beta < \pi$. Find:

(a) $\sin(\alpha)$

(b) $\cos(\beta)$

(c) $\sin(2\alpha)$

(d) $\cos(\alpha - \beta)$

(e) $\cot(\alpha)$

(f) $\sec(\alpha - \beta)$

13. Sketch the graphs of the following functions. Label at least two points (ordered pairs) on each.

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

(b) $g(x) = \ln(x + 6)$

14. (a) Rewrite as a sum or difference of multiples of logarithms

$$\log(8b/c^2)$$

(b) Rewrite as a single logarithm

$$3 \ln(2) + 2 \ln(3)$$

(c) Simplify

$$\log_5(25^{1/3})$$

(d) Simplify

$$e^{1/2}e^{1/3}e^{-1/4}$$

15. Solve

(a) $2^{x+3} = 4^6$

(b) $\log(x - 1) + \log(x - 3) = 0$

16. The surface area of a cylindrical tube of height h and radius r is given by $A = 2\pi rh$. Suppose the height in terms of the radius is given by $h = r^2 + 3$.

(a) Write a formula for the area of the tube in terms of the radius r .

(b) Find the area of the tube when the radius $r = 2$.

17. Consider the rational function

$$f(x) = \frac{x^2 - 4x - 5}{x^2 - 2}.$$

(a) Find all zeros of f .

(b) Find all vertical asymptotes of f .

(c) Find any horizontal asymptotes of f .

(d) Sketch the graph of f .

18. Complete the square and follow any additional instructions.

(a) $x^2 - 6x + 27$.

(b) $f(x) = x^2 - 16x - 34$. Relate your answer to the vertex of the parabola given by the graph of f .

(c) $f(x, y) = x^2 + 4x + y^2 - 12y + 17$. Relate your answer to the center of the circle given by the graph of f .