

Name: SOLUTIONS

Precalculus score 10 Calculus score 10

### Diagnostic Quiz on Precalculus and Calculus I computational skills

To do well in Calculus II, you need to have excellent precalculus and Calculus I skills. This diagnostic quiz will help you determine where your skills could use some extra practice. Please give yourself only the time indicated. If you have difficulty with any subquestion, skip it and go on. We will provide a worksheet for each question so that you can practice as needed.

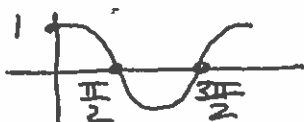
#### Part 1: Precalculus - give yourself 10 minutes

1. Find an equation for the line through the points (3,0) and (0,2).

$$\boxed{\frac{x}{3} + \frac{y}{2} = 1} \quad \text{OR} \quad \boxed{y = 2 - \frac{2}{3}x} \quad \text{OR} \quad \boxed{y = -\frac{2}{3}(x-3)}, \text{ etc}$$

2. Graph the following functions, and give the coordinates of where they cross the axes.

a)  $f(x) = \cos x, 0 \leq x \leq 2\pi$



b)  $f(x) = \ln x$

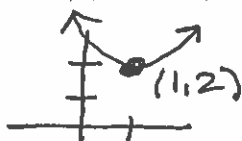


c)  $f(x) = e^{-x}$

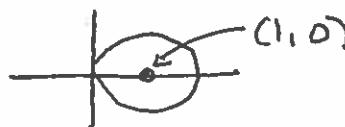


3. Graph the following curves. Indicate the coordinates of the vertex or center.

a)  $y - 2 = (x - 1)^2$



b)  $y^2 + x^2 - 2x = 0$



4. Solve the following inequalities for  $x$ . Write your answers in the form  $a < x < b$ .

(a)  $\left| \frac{x-3}{5} \right| < 1$

$$\boxed{-2 < x < 8}$$

(b)  $\sqrt{\frac{1}{x}} > 10$

$$\boxed{0 < x < \frac{1}{100}}$$

5. Compute the limits.

(a)  $\lim_{x \rightarrow 0} \frac{x^2 + 2e^x}{x^3 + x + 1}$

$$\boxed{2}$$

(b)  $\lim_{x \rightarrow \infty} \frac{x^2 + 2 \ln x}{x^3 + x + 1}$

$$\boxed{0}$$

Part 2: Calculus - give yourself 15 minutes

6. Complete this limit definition of the derivative: Given a function  $f$ , the derivative of  $f$  at  $a$  is given by

$$f'(a) = \lim_{h \rightarrow 0} \left( \frac{f(a+h) - f(a)}{h} \right) \text{ if this limit exists.}$$

7. Give the derivatives of the following functions.

a)  $f(x) = \sec x$

$$\sec x \tan x$$

b)  $f(x) = \sqrt{x}$

$$\frac{1}{2\sqrt{x}} \text{ or } \frac{1}{2}x^{-\frac{1}{2}}$$

c)  $f(x) = 2^x$

$$2^x \ln 2$$

8. Find the derivative of the following functions.

(a)  $f(x) = [\sin(x + x^2) + x]^4$

$$4[\sin(x + x^2) + x]^3 (\cos(x + x^2)(1 + 2x) + 1)$$

check parentheses!

(b)  $f(x) = e^{-2x} \cos(3x)$

$$-2e^{-2x} \cos(3x) - 3e^{-2x} \sin(3x)$$

9. Compute the integrals.

a)  $\int \frac{1}{1+x^2} dx$

$$\arctan x + C$$

b)  $\int \sqrt{x} dx$

$$\frac{2}{3} x^{\frac{3}{2}} + C$$

10. Compute the definite integrals. Simplify as much as possible.

(a)  $\int_0^4 x \sin(x^2) dx.$

$$-\frac{1}{2} \cos 16 + \frac{1}{2}$$

(b)  $\int_0^3 \frac{x}{1+2x^2} dx.$

$$\frac{\ln(19)}{4}$$

Notes: **No partial credit** except:

- okay to not mention limit needs to exist ~~of~~  $f(a)$
- okay to forget "+C"

Each subproblem is worth 1 point.